

FCC Test Report

Product Name : Dual Band 3x3 802.11ac PCI-E Adapter
Model No. : PCE-AC68
FCC ID. : MSQ- PCEAC68

Applicant : ASUSTeK COMPUTER INC.

Address : 4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan

Date of Receipt : 2013/07/02

Issued Date : 2013/08/29

Report No. : 137132R-RFUSP46V01

Report Version : V4.0



The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

Test Report Certification

Issued Date : 2013/08/29

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Product Name : Dual Band 3x3 802.11ac PCI-E Adapter
 Applicant : ASUSTeK COMPUTER INC.
 Address : 4F, No. 150, Li-Te Rd., Peitou, Taipei, Taiwan
 Manufacturer : Arcadyan Technology Corporation
 Model No. : PCE-AC68
 FCC ID. : MSQ- PCEAC68
 EUT Voltage : DC 3.3V (Power by PC)
 Trade Name : ASUS
 Applicable Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.407:2012
 ANSI C63.4: 2009
 Test Result : Complied

The test results relate only to the samples tested.

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Laboratory Information

We, **QuieTek Corporation**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C.	:	TAF, Accreditation Number: 1313
USA	:	FCC, Registration Number: 365520
Canada	:	IC, Submission No: 150981

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site:<http://www.quietek.com/tw/ctg/cts/accreditations.htm>

The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : <http://www.quietek.com/>

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1. General Information

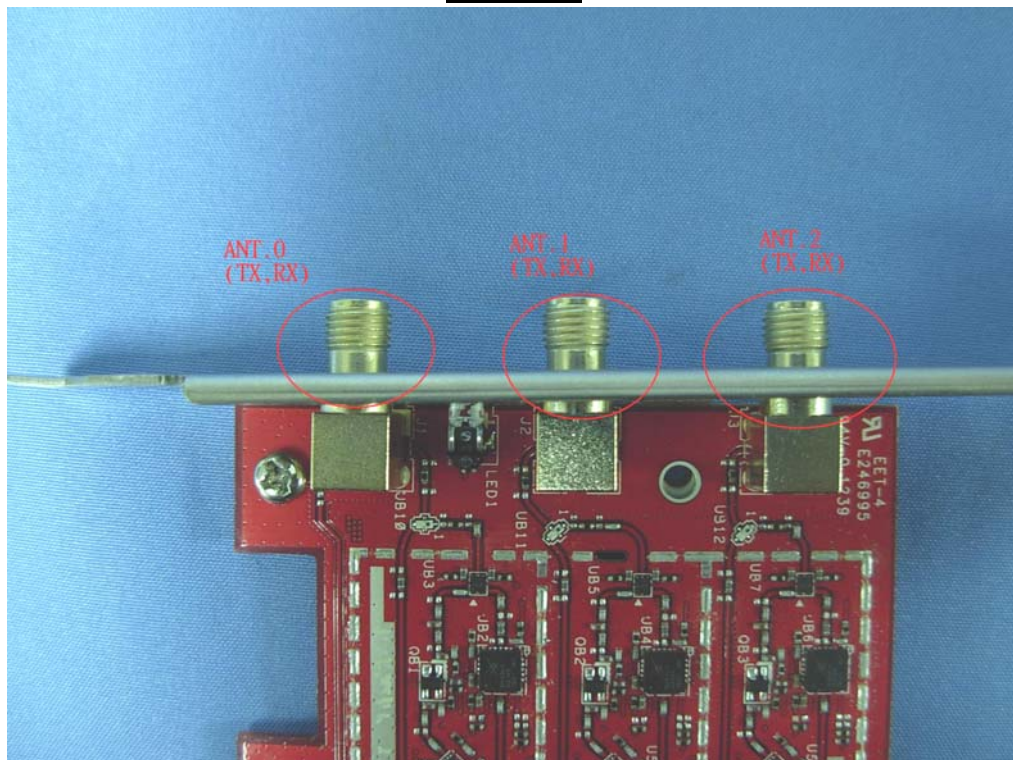
1.1. EUT Description

Product Name	Dual Band 3x3 802.11ac PCI-E Adapter	
Product Type	WLAN (3TX, 3RX)	
Trade Name	ASUS	
Model No.	PCE-AC68	
Frequency Range/ Channel Number	IEEE 802.11a/ IEEE 802.11n (20MHz) / IEEE 802.11ac (20MHz)	5180~5240MHz / 4 Channels
	IEEE 802.11n (40MHz) / IEEE 802.11ac (40MHz)	5190~5230MHz / 2 Channels
	IEEE 802.11ac (80MHz)	5210~5210MHz / 1 Channel
Type of Modulation	IEEE 802.11a/n/ac	Orthogonal Frequency Division Multiplexing (OFDM)
Data Speed	IEEE 802.11a	6, 9, 18, 24, 36, 48, 54Mbps
	IEEE 802.11n	Support a subset of the combination of GI, MCS 0~MCS 23 and bandwidth defined in 802.11n
	IEEE 802.11ac	Support a subset of the combination of GI, MCS 0~MCS 9 and bandwidth defined in 802.11ac
Antenna Gain	Ant0: 3dBi, Ant1: 3dBi, Ant2: 3dBi	
Beamforming Gain	2.4G:NA 5G: 4.77dB	
Antenna Type	Dipole Antenna	

ANT-TX / RX & Bandwidth

ANT-TX / RX	TX			RX		
	20MHz	40MHz	80MHz	20MHz	40MHz	80MHz
IEEE802.11a	✓	✗	✗	✓	✗	✗
IEEE802.11n	✓	✓	✗	✓	✓	✗
IEEE802.11ac	✓	✓	✓	✓	✓	✓

3TX / 3RX



IEEE 802.11n

MCS Index	Modulation	R	N _{BPSCS}	N _{CBPS}		N _{DBPS}		Data Rate(Mb/s)			
				20MHz	40MHz	20MHz	40MHz	800ns GI		400ns GI (Note1)	
								20MHz	40MHz	20MHz	40MHz
0	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.2	15.0
1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.4	30.0
2	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.7	45.0
3	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.9	60.0
4	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.3	90.0
5	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.8	120.0
6	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.0	135.0
7	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.2	150.0

Note 1: Support of 400ns GI is optional on transmit and receive.

Table 1 – MCS parameters for TX Antenna number = 1

MCS Index	Modulation	R	N _{BPSCS}	N _{CBPS}		N _{DBPS}		Data Rate(Mb/s)			
				20MHz	40MHz	20MHz	40MHz	800ns GI		400ns GI (Note1)	
								20MHz	40MHz	20MHz	40MHz
8	BPSK	1/2	1	104	216	52	108	13.0	27.0	14.4	30.0
9	QPSK	1/2	2	208	432	104	216	26.0	54.0	28.9	60.0
10	QPSK	3/4	2	208	432	156	324	39.0	81.0	43.3	90.0
11	16-QAM	1/2	4	416	864	208	432	52.0	108.0	57.8	120.0
12	16-QAM	3/4	4	416	864	312	648	78.0	162.0	86.7	180.0
13	64-QAM	2/3	6	624	1296	416	864	104.0	216.0	115.6	240.0
14	64-QAM	3/4	6	624	1296	468	972	117.0	243.0	130.0	270.0
15	64-QAM	5/6	6	624	1296	520	1080	130.0	270.0	144.4	300.0

Note 1: Support of 400ns GI is optional on transmit and receive.

Table 2 – MCS parameters for TX Antenna number = 2

MCS Index	Modulation	R	N _{BPSCS}	N _{CBPS}		N _{DBPS}		Data Rate(Mb/s)			
				20MHz	40MHz	20MHz	40MHz	800ns GI		400ns GI (Note1)	
								20MHz	40MHz	20MHz	40MHz
16	BPSK	1/2	1	156	324	78	162	19.5	40.5	21.7	45.0
17	QPSK	1/2	2	312	648	156	324	39.0	81.0	43.3	90.0
18	QPSK	3/4	2	312	648	234	486	58.5	121.5	65.0	135.0
19	16-QAM	1/2	4	624	1296	312	648	78.0	162.0	86.7	180.0
20	16-QAM	3/4	4	624	1296	468	972	117.0	243.0	130.0	270.0
21	64-QAM	2/3	6	936	1944	624	1296	156.0	324.0	173.3	360.0
22	64-QAM	3/4	6	936	1944	702	1458	175.5	364.5	195.0	405.0
23	64-QAM	5/6	6	936	1944	780	1620	195.0	405.0	216.7	450.0

Note 1: Support of 400ns GI is optional on transmit and receive.

Table 3 – MCS parameters for TX Antenna number = 3

Symbol	Explanation
R	Code rate
N _{BPSCS}	Number of coded bits per single carrier
N _{CBPS}	Number of coded bits per symbol
N _{DBPS}	Number of data bits per symbol
GI	guard interval

Draft IEEE 802.11ac Data Rate

Spatial Streams (Note1)	MCS Index	Modulation type	Coding rate	Data Rate(Mb/s)							
				20 MHz		40 MHz		80 MHz		160 MHz	
				Guard Interval		Guard Interval		Guard Interval		Guard Interval	
				800ns	400ns	800ns	400ns	800ns	400ns	800ns	400ns
1	0	BPSK	1/2	6.5	7.2	13.5	15	29.3	32.5	58.5	65
	1	QPSK	1/2	13	14.4	27	30	58.5	65	117	130
	2	QPSK	3/4	19.5	21.7	40.5	45	87.8	97.5	175.5	195
	3	16-QAM	1/2	26	28.9	54	60	117	130	234	260
	4	16-QAM	3/4	39	43.3	81	90	175.5	195	351	390
	5	64-QAM	2/3	52	57.8	108	120	234	260	468	520
	6	64-QAM	3/4	58.5	65	121.5	135	263.3	292.5	526.5	585
	7	64-QAM	5/6	65	72.2	135	150	292.5	325	585	650
	8	256-QAM	3/4	78	86.7	162	180	351	390	702	780
	9	256-QAM	5/6	N/A	N/A	180	200	390	433.3	780	866.7
2	0	BPSK	1/2	13	14.4	27	30	58.6	65	117	130
	1	QPSK	1/2	26	28.8	54	60	117	130	234	260
	2	QPSK	3/4	39	43.4	81	90	175.6	195	351	390
	3	16-QAM	1/2	52	57.8	108	120	234	260	468	520
	4	16-QAM	3/4	78	86.6	162	180	351	390	702	780
	5	64-QAM	2/3	104	115.6	216	240	468	520	936	1040
	6	64-QAM	3/4	117	130	243	270	526.6	585	1053	1170
	7	64-QAM	5/6	130	144.4	270	300	585	650	1170	1300
	8	256-QAM	3/4	156	173.4	324	360	702	780	1404	1560
	9	256-QAM	5/6	N/A	N/A	360	400	780	866.6	1560	1733.4
3	0	BPSK	1/2	19.5	21.6	40.5	45	87.9	97.5	175.5	195
	1	QPSK	1/2	39	43.2	81	90	175.5	195	351	390
	2	QPSK	3/4	58.5	65.1	121.5	135	263.4	292.5	526.5	585
	3	16-QAM	1/2	78	86.7	162	180	351	390	702	780
	4	16-QAM	3/4	117	129.9	243	270	526.5	585	1053	1170
	5	64-QAM	2/3	156	173.4	324	360	702	780	1404	1560
	6	64-QAM	3/4	175.5	195	364.5	405	789.9	877.5	1579.5	1755
	7	64-QAM	5/6	195	216.6	405	450	877.5	975	1755	1950
	8	256-QAM	3/4	234	260.1	486	540	1053	1170	2106	2340
	9	256-QAM	5/6	N/A	N/A	540	600	1170	1299.9	2340	2600.1

IEEE 802.11a & IEEE 802.11n (20MHz) & IEEE 802.11ac (20MHz)

Working Frequency of Each Channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
36	5180MHz	40	5200MHz	44	5220MHz	48	5240MHz

IEEE 802.11n (40MHz) & IEEE 802.11ac (40MHz)

Working Frequency of Each Channel			
Channel	Frequency	Channel	Frequency
38	5190MHz	46	5230MHz

IEEE 802.11ac (80MHz)

Working Frequency of Each Channel	
Channel	Frequency
42	5210 MHz

Note:

1. This device is a Dual Band 3x3 802.11ac PCI-E Adapter including 2.4GHz b/g/n and 5GHz a/n (3x3) transmitting and receiving function.
2. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart C Paragraph 15.407.
3. Regards to the frequency band operation; the lowest , middle and highest frequency of channel were selected to perform the test, and then shown on this report.
4. The function of the 2.4GHz & 5.8GHz transmitting is measured and makes a test report of the report number: 137132R-RFUSP42V01.
5. This device is a composite device in accordance with Part 15 regulations. The receiving function receiving was tested and its test report number is 137132R-RFUSP37V02 under Declaration of Conformity.

1.3. Test Mode

Quietek has verified the construction and function in typical operation. The preliminary tests were performed in different data rate, and to find the worst condition, which was shown in this test report. The following table is the final test mode.

TX	Mode 1: Transmit (CDD mode) Mode 2: Transmit (Beamforming mode)
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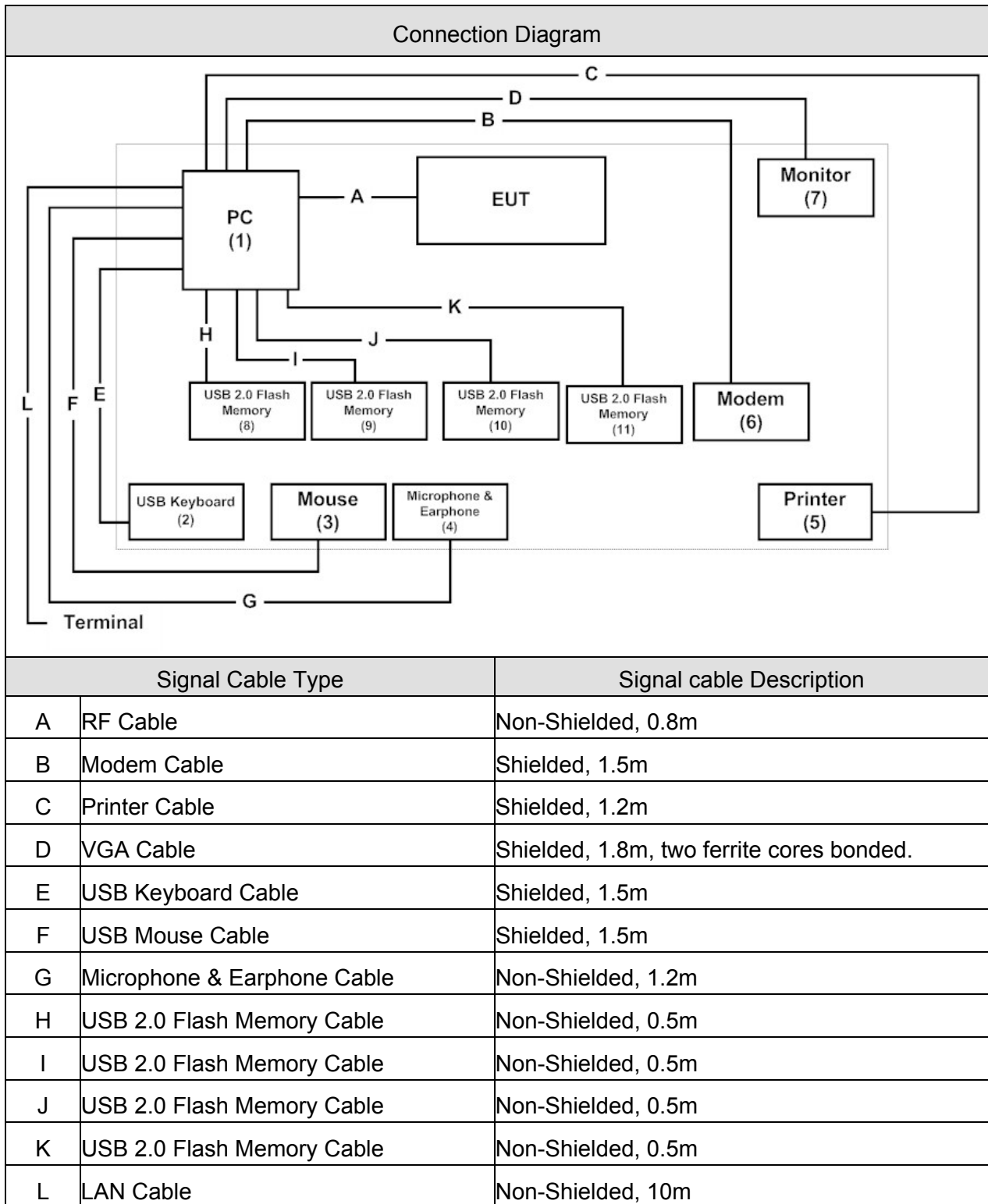
Test Items	Modulation	Channel	Antenna	Result
Conducted Emission	11ac (80MHz)	42	0+1+2	Complies
99 % & 26dB Bandwidth	a	36/44/48	0/1/2	Complies
	11n (20MHz)	36/44/48	0/1/2	Complies
	11n (40MHz)	38/46	0/1/2	Complies
	11ac (80MHz)	42	0/1/2	Complies
Peak Transmit Output	a	36/44/48	0+1+2	Complies
	11n (20MHz)	36/44/48	0+1+2	Complies
	11n (40MHz)	38/46	0+1+2	Complies
	11ac (80MHz)	42	0+1+2	Complies
Peak Power Spectrum Density	a	36/44/48	0+1+2	Complies
	11n (20MHz)	36/44/48	0+1+2	Complies
	11n (40MHz)	38/46	0+1+2	Complies
	11ac (80MHz)	42	0+1+2	Complies
Power Excursion	a	36/44/48	0	Complies
	11n (20MHz)	36/44/48	0/1/2	Complies
	11n (40MHz)	38/46	0/1/2	Complies
	11ac (80MHz)	42	0/1/2	Complies
Radiated Emission	a	36/44/48	0+1+2	Complies
	11n (20MHz)	36/44/48	0+1+2	Complies
	11n (40MHz)	38/46	0+1+2	Complies
	11ac (80MHz)	42	0+1+2	Complies
Band Edge	a	36	0+1+2	Complies
	11n (20MHz)	36	0+1+2	Complies
	11n (40MHz)	38	0+1+2	Complies
	11ac (80MHz)	42	0+1+2	Complies
Frequency Stability	a	36/44/48	0	Complies
	11n (20MHz)	36/44/48	0/1/2	Complies
	11n (40MHz)	38/46	0/1/2	Complies
	11ac (80MHz)	42	0/1/2	Complies

1.4. Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1 PC	DELL	DCSM	00144-531-356-513	DoC	Non-Shielded, 1.8m
2 USB Keyboard	DELL	SK-8115	1437	DoC	--
3 Mouse	Logitech	M-SBF83	HCA52200315	DoC	--
4 Microphone & Earphone	Fujiei	SBZ-38	N/A	DoC	--
5 Printer	HP	C2642A	MY75N1D2Y1	DoC	Non-Shielded, 0.7m
6 Modem	ACEEX	DM-1414	980033034	DoC	Non-Shielded, 1.6m
7 Monitor	DELL	U2410f	082WXD-72872-16 R-0W2L	DoC	Non-Shielded, 1.8m
8 USB 2.0 Flash Memory	Apacer	AH223	N/A	DoC	--
9 USB 2.0 Flash Memory	Apacer	AH223	N/A	DoC	--
10 USB 2.0 Flash Memory	Apacer	AH223	N/A	DoC	--
11 USB 2.0 Flash Memory	Apacer	AH223	N/A	DoC	--

1.5. Configuration of tested System



1.6. EUT Exercise Software

1	Setup the EUT as shown in Section 1.5.
2	Execute the control program “Mtool Ver 1.0.0.9” on the EUT.
3	Configure the test mode, the test channel, and the data rate.
4	Press “Start TX” to start the continuous transmitting.
5	Verify that the EUT works properly.

1.7. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
Temperature (°C)	FCC PART 15 C 15.407 Conducted Emission	15 - 35	20
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 99 % & 26dB Bandwidth	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Peal Transmit Power	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Peak Power Spectrum	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Density	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Power Excursion	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Radiated Emission	15 - 35	25
Humidity (%RH)		25 - 75	65
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Band Edge	15 - 35	25
Humidity (%RH)		25 - 75	58
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.407 Frequency Stability	15 - 35	25
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000

2. Conducted Emission

2.1. Test Equipment

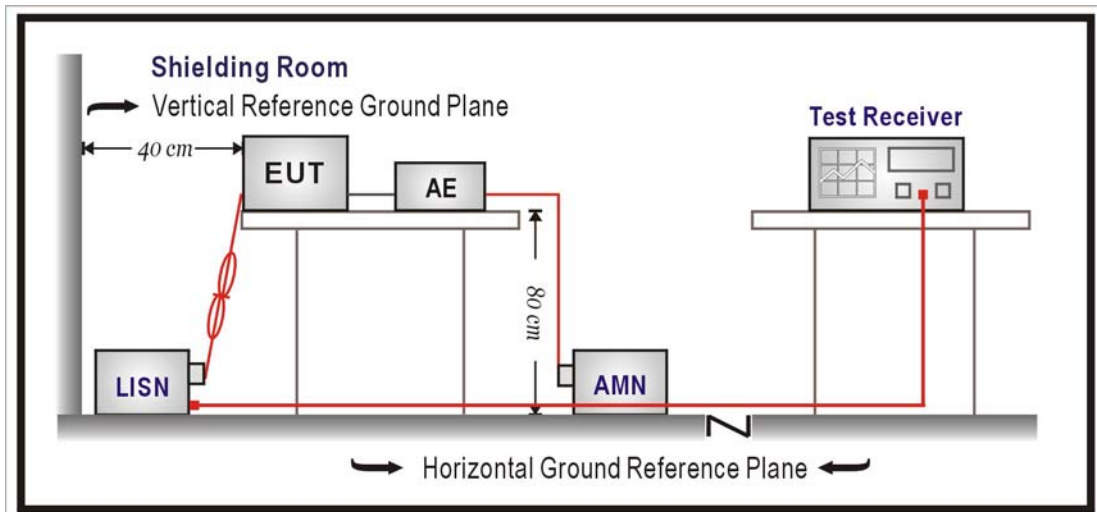
The following test equipments are used during the test:

Conducted Emission / SR3

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Artificial Mains Network	R&S	ENV4200	848411/010	2013/02/13
LISN	R&S	ENV216	100092	2013/08/21
Test Receiver	R&S	ESCS 30	825442/014	2013/08/07

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

2.2. Test Setup



2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 Limits (dBuV)		
Frequency MHz	QP	AV
0.15 - 0.50	66-56	56-46
0.50 - 5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

2.4. Test Procedure

The EUT was setup according to ANSI C63.4: 2009. The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs.)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9 kHz.

2.5. Test Specification

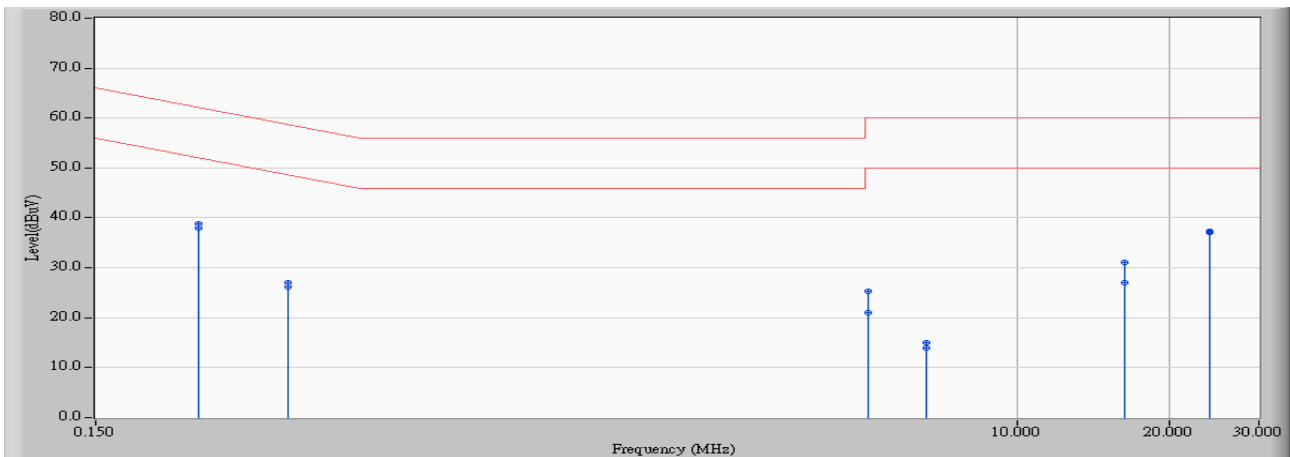
According to FCC Part 15 Subpart C Paragraph 15.207:2012

2.6. Uncertainty

The measurement uncertainty is defined as ± 2.26 dB.

2.7. Test Result

Site : SR3	Time : 2012/10/17 - 13:29
Limit : CISPR_B_00M_QP	Margin : 10
Probe : SR3_LISN(16A)-1_0907 - Line1	Power : DC 3.3V (Power by PC)
EUT : Dual Band 3x3 802.11ac PCI-E Adapter	Note : Mode 1: Transmit (CDD mode) 5210MHz,802.11ac(80M)

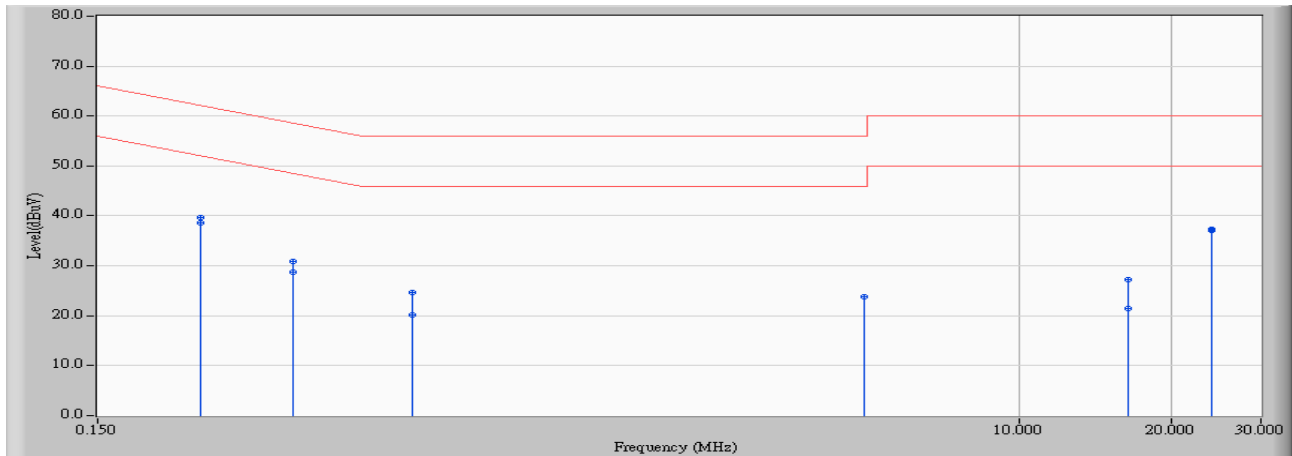


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.240	9.663	29.200	38.863	-23.239	62.102	QUASIPeAK
2	0.240	9.663	28.250	37.913	-14.189	52.102	AVERAGE
3	0.361	9.680	17.350	27.030	-31.677	58.707	QUASIPeAK
4	0.361	9.680	16.410	26.090	-22.617	48.707	AVERAGE
5	5.068	10.059	15.180	25.239	-34.761	60.000	QUASIPeAK
6	5.068	10.059	11.030	21.089	-28.911	50.000	AVERAGE
7	6.591	10.082	5.010	15.091	-44.909	60.000	QUASIPeAK
8	6.591	10.082	3.790	13.871	-36.129	50.000	AVERAGE
9	16.302	10.270	20.850	31.120	-28.880	60.000	QUASIPeAK
10	16.302	10.270	16.800	27.070	-22.930	50.000	AVERAGE
11	24.009	10.340	26.880	37.220	-22.780	60.000	QUASIPeAK
12	* 24.009	10.340	26.730	37.070	-12.930	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : SR3	Time : 2012/10/17 - 13:32
Limit : CISPR_B_00M_QP	Margin : 10
Probe : SR3_LISN(16A)-1_0907 - Line2	Power : DC 3.3V (Power by PC)
EUT : Dual Band 3x3 802.11ac PCI-E Adapter	Note : Mode 1: Transmit (CDD mode) 5210MHz,802.11ac(80M)



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.240	9.673	29.940	39.613	-22.489	62.102	QUASPEAK
2	0.240	9.673	29.010	38.683	-13.419	52.102	AVERAGE
3	0.365	9.691	21.150	30.841	-27.777	58.617	QUASPEAK
4	0.365	9.691	19.090	28.781	-19.837	48.617	AVERAGE
5	0.627	9.728	14.990	24.718	-31.282	56.000	QUASPEAK
6	0.627	9.728	10.500	20.228	-25.772	46.000	AVERAGE
7	4.912	10.081	13.750	23.830	-32.170	56.000	QUASPEAK
8	16.431	10.410	16.730	27.140	-32.860	60.000	QUASPEAK
9	16.431	10.410	11.040	21.450	-28.550	50.000	AVERAGE
10	24.009	10.574	26.800	37.374	-22.626	60.000	QUASPEAK
11	* 24.009	10.574	26.540	37.114	-12.886	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " * ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

3. 99% & 26dB Bandwidth

3.1. Test Equipment

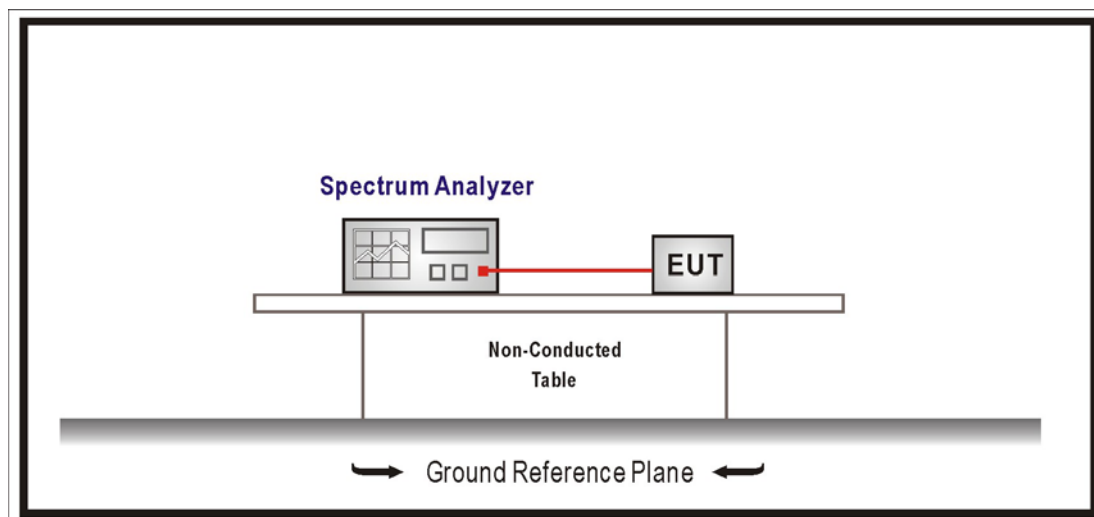
The following test equipments are used during the radiated emission tests:

99% & 26dB Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2014/08/05

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

3.2. Test Setup



3.3. Limits

No Required

3.4. Test Procedure

The EUT was tested according to U-NII test procedure of March 2012 KDB 789033. Set RBW 1% of the emission bandwidth, VBW equal to 3 times the RBW.

3.5. Uncertainty

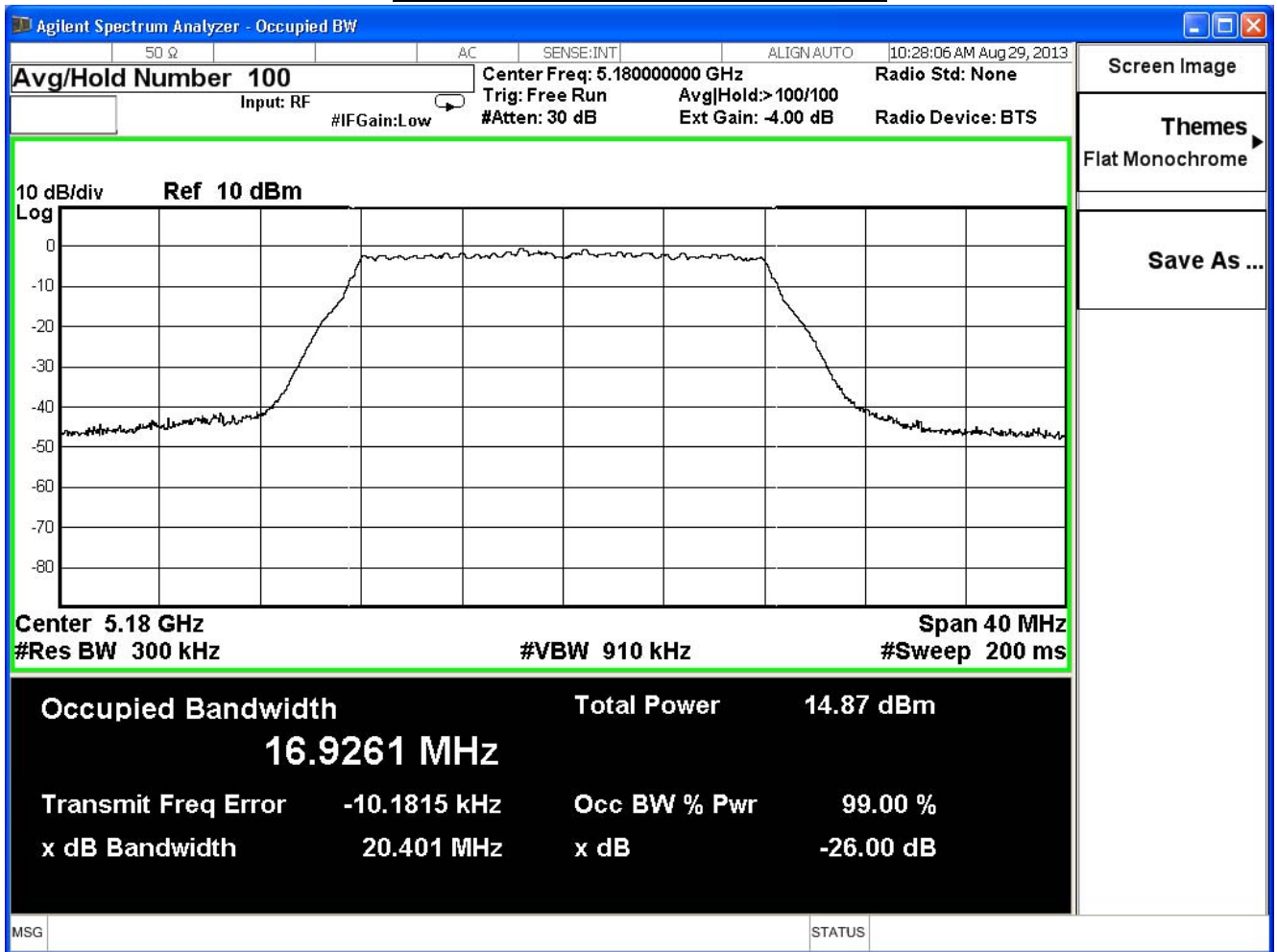
The measurement uncertainty is defined as $\pm 150\text{Hz}$

3.6. Test Result

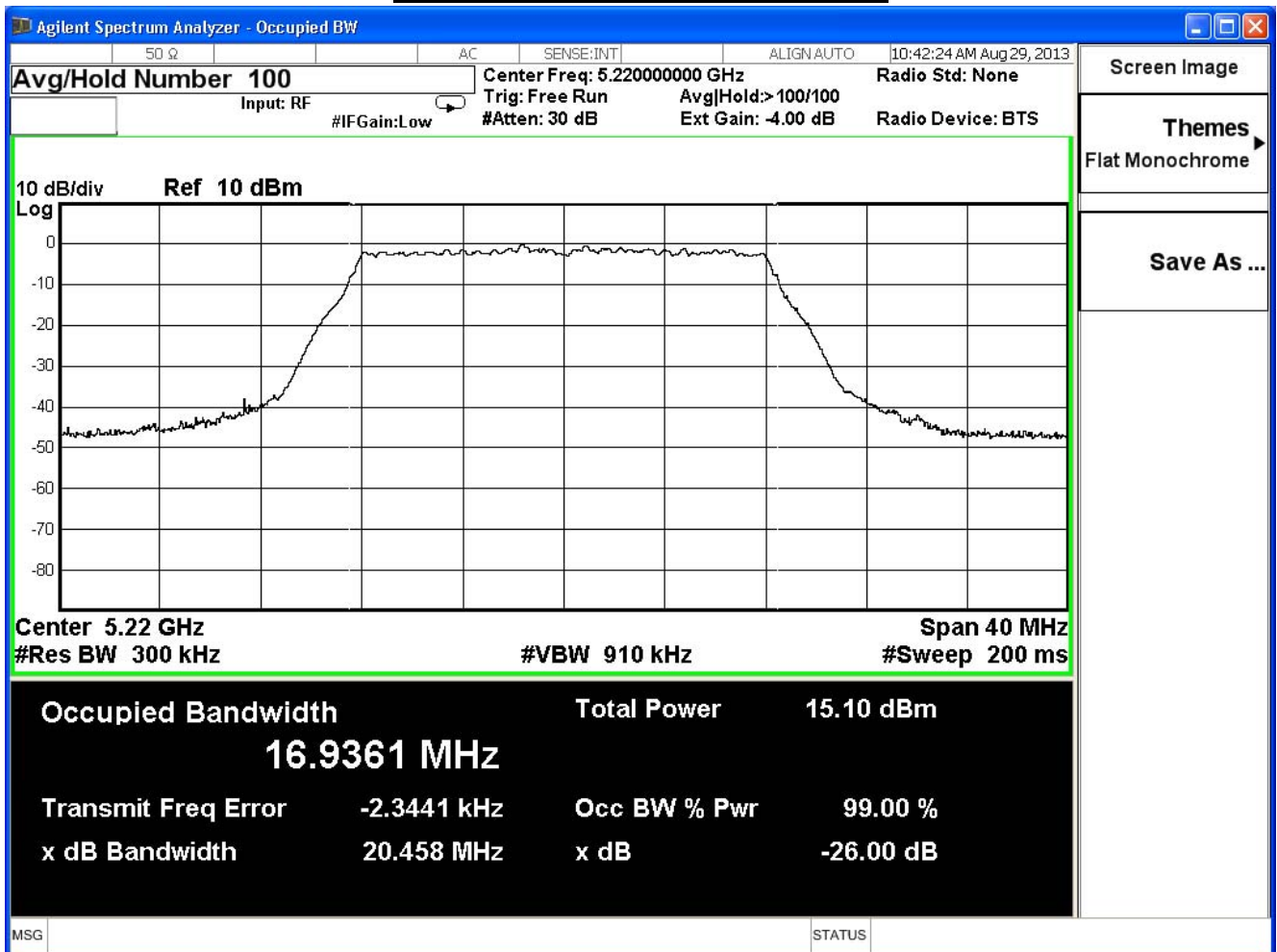
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/29	Test Site	SR7

802.11a (ANT 0)					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.40	16.92	--	NA
44	5220	20.45	16.93	--	NA
48	5240	20.42	16.92	--	NA

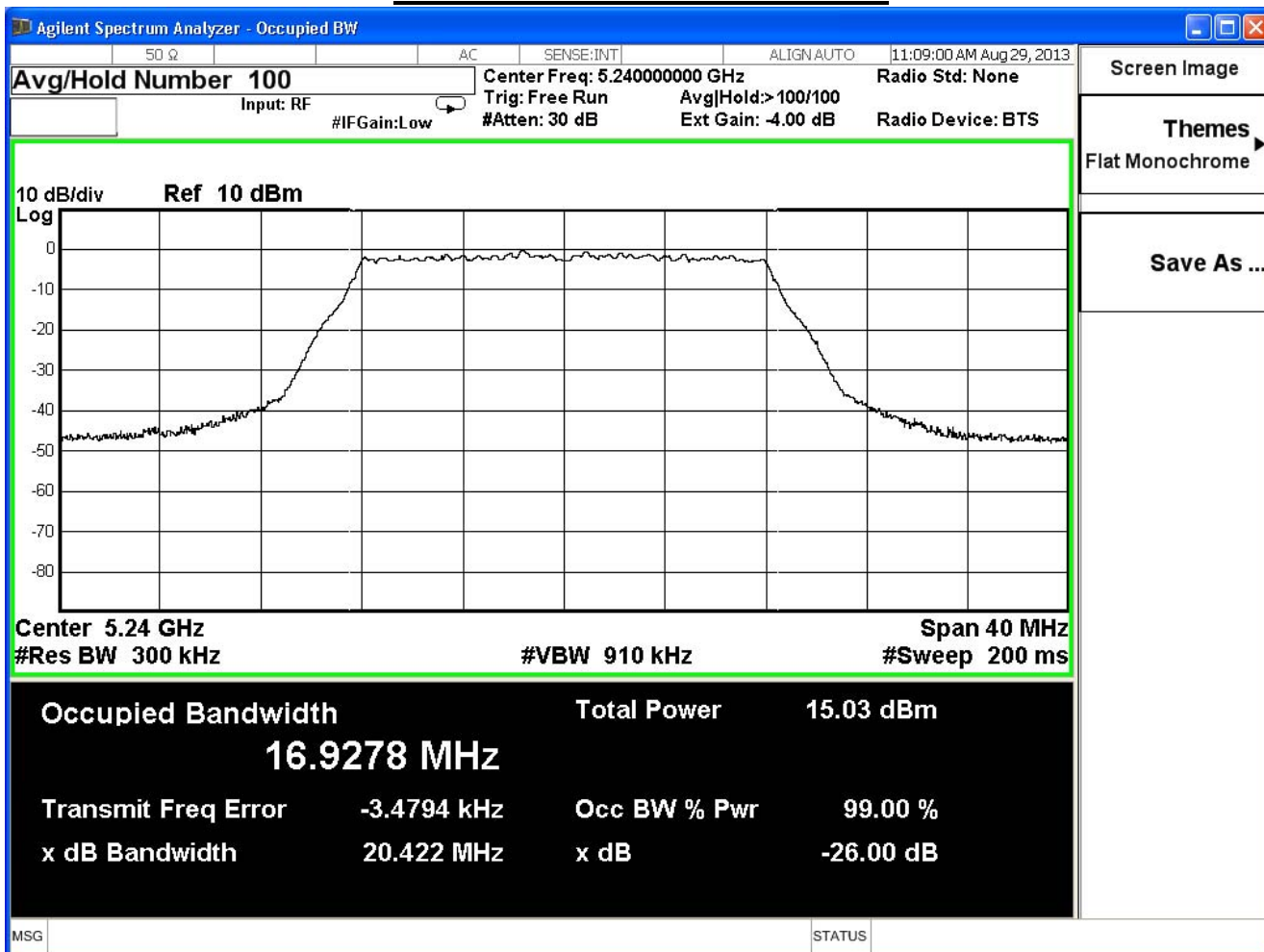
99% & 26dB Bandwidth – Channel 36



99% & 26dB Bandwidth – Channel 44



99% & 26dB Bandwidth – Channel 48

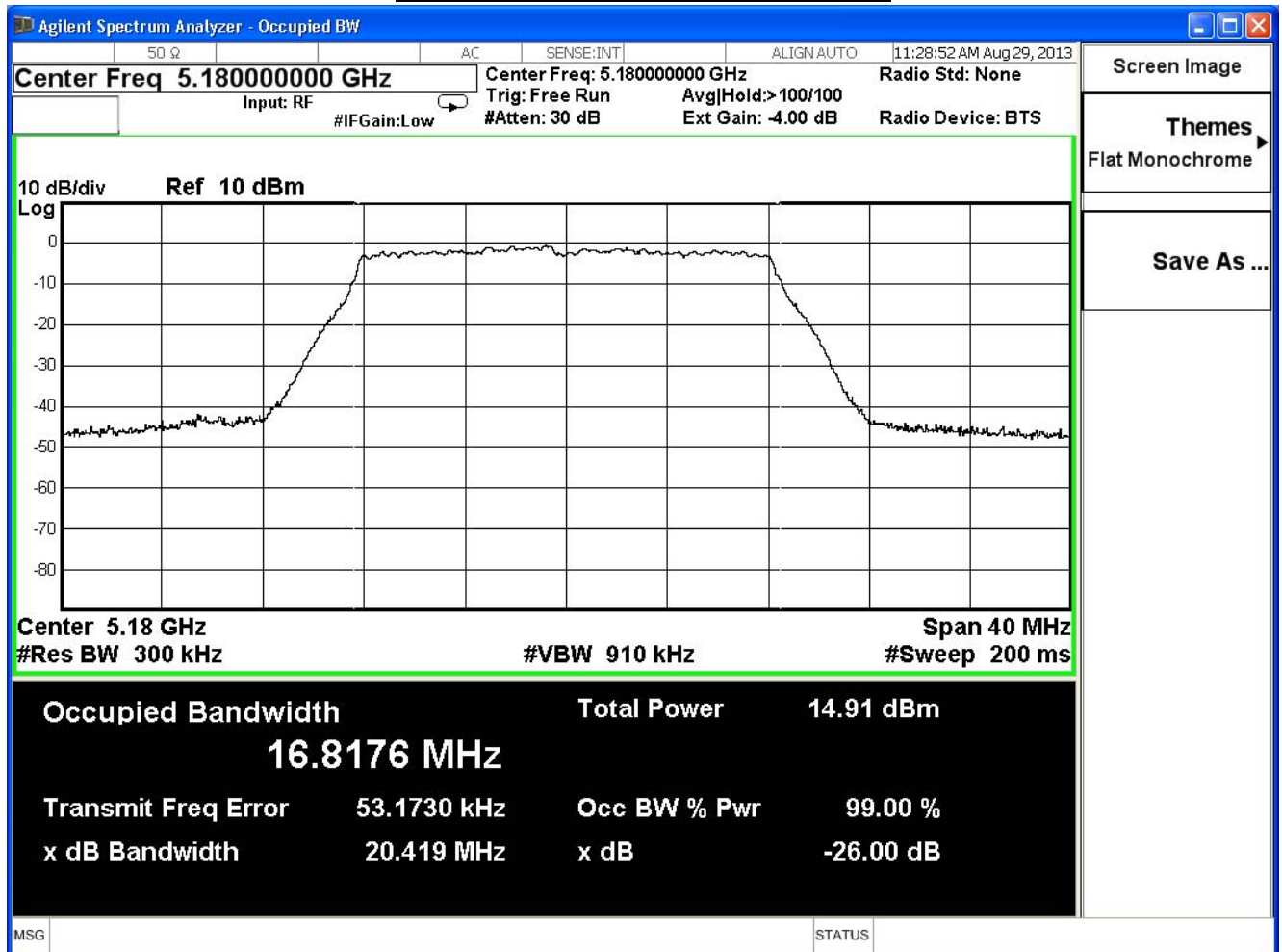


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/29	Test Site	SR7

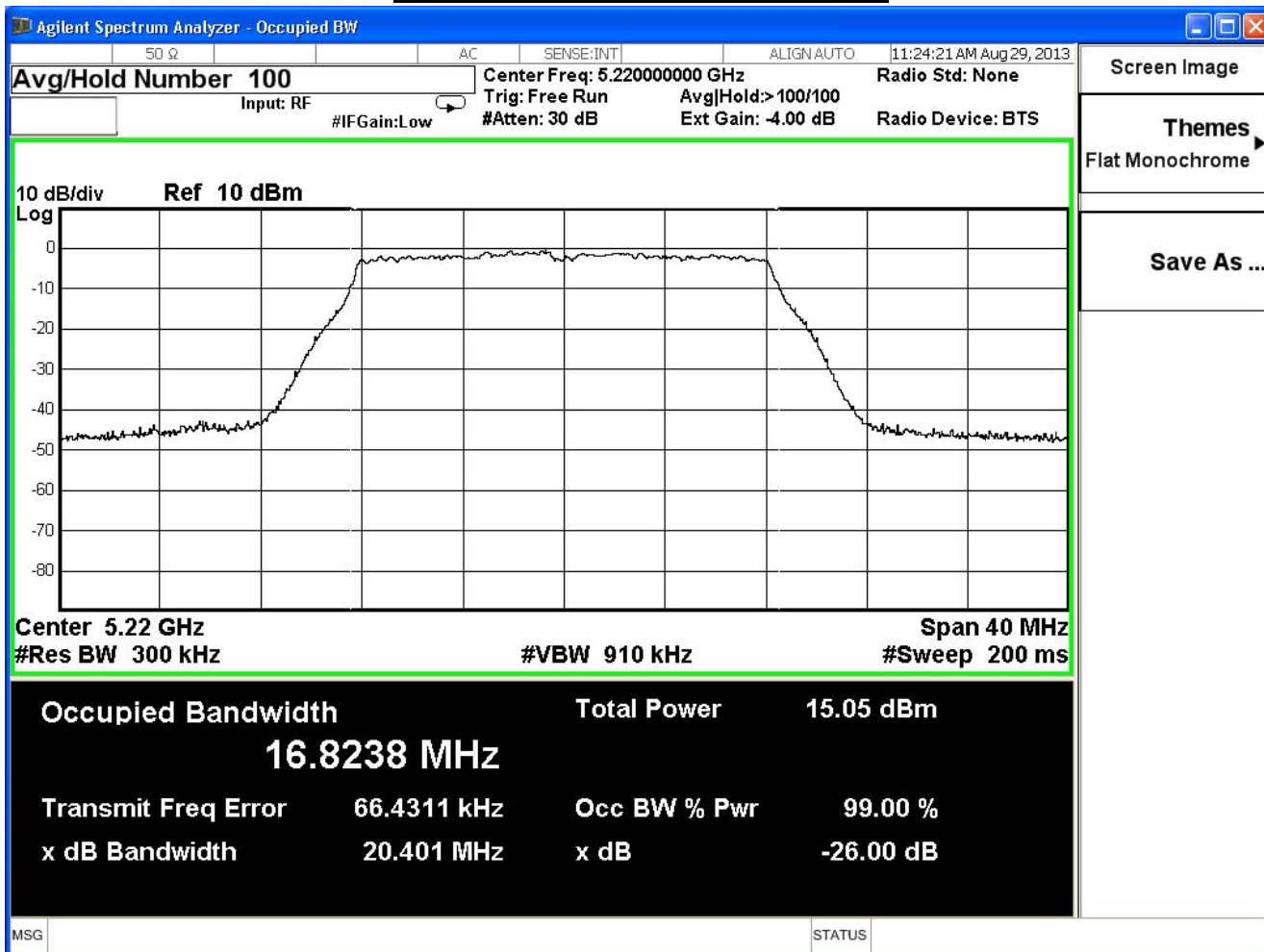
802.11a (ANT 1)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.41	16.81	--	NA
44	5220	20.40	16.82	--	NA
48	5240	20.45	16.81	--	NA

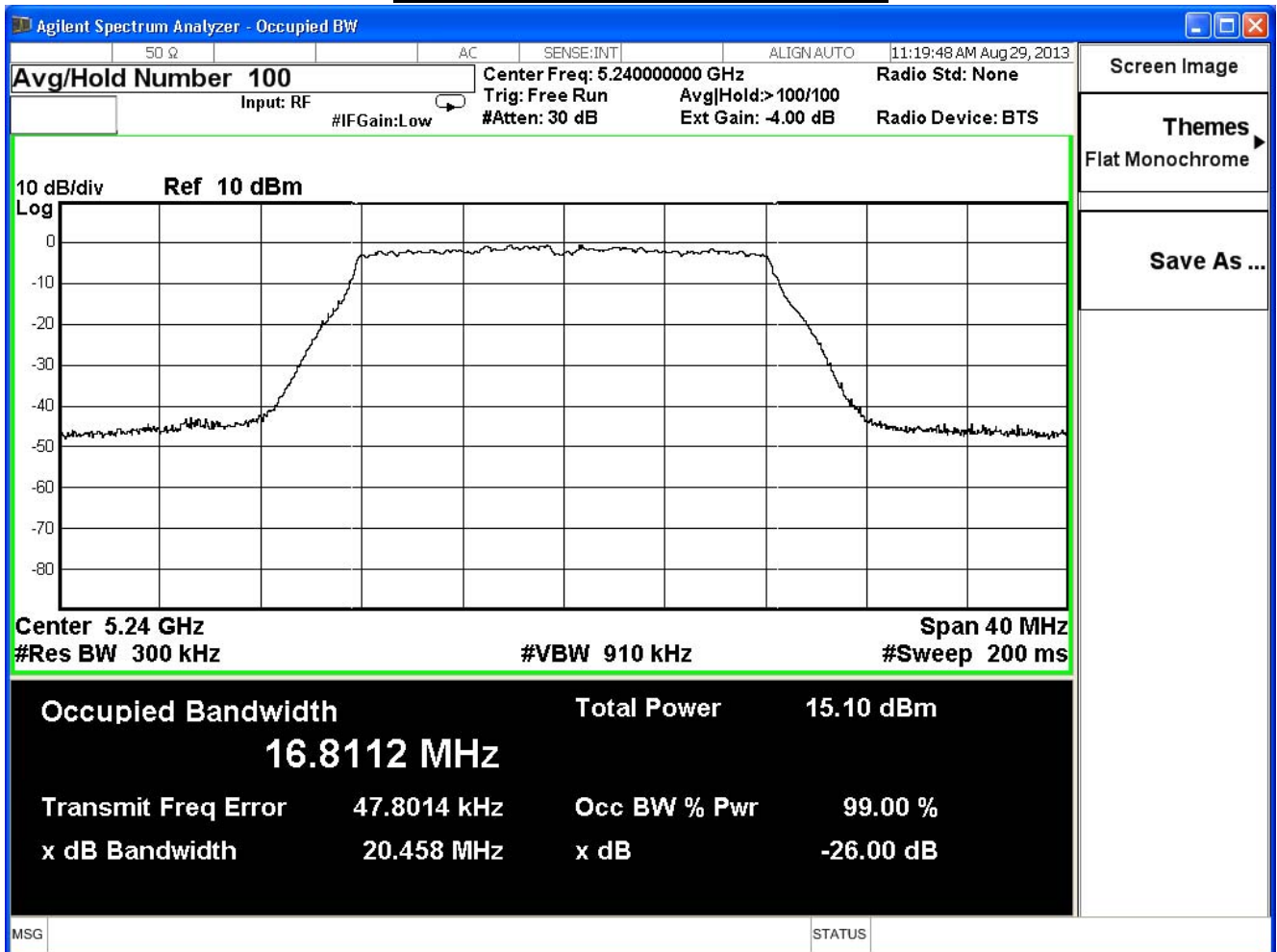
99% & 26dB Bandwidth – Channel 36



99% & 26dB Bandwidth – Channel 44



99% & 26dB Bandwidth – Channel 48

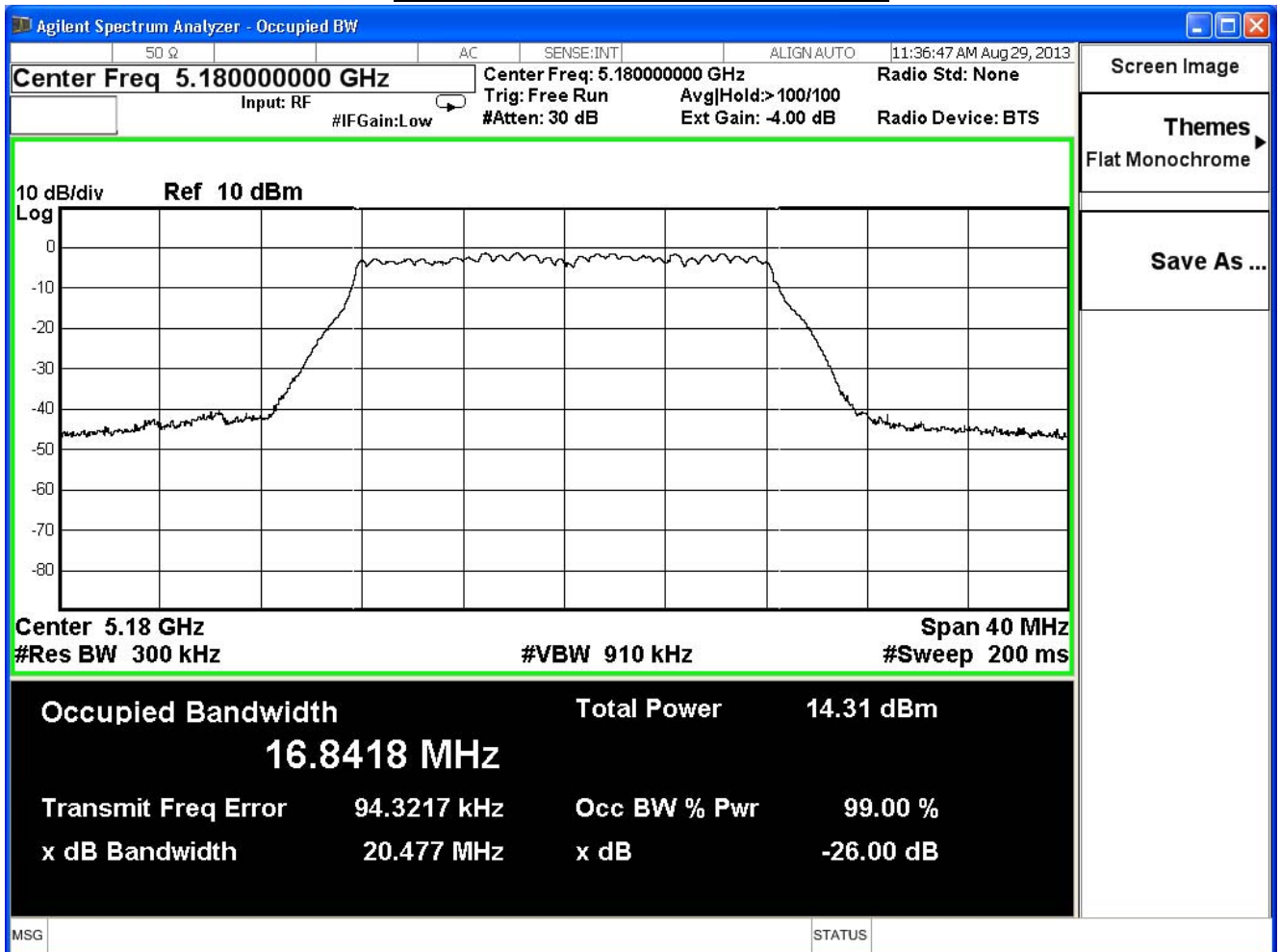


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/29	Test Site	SR7

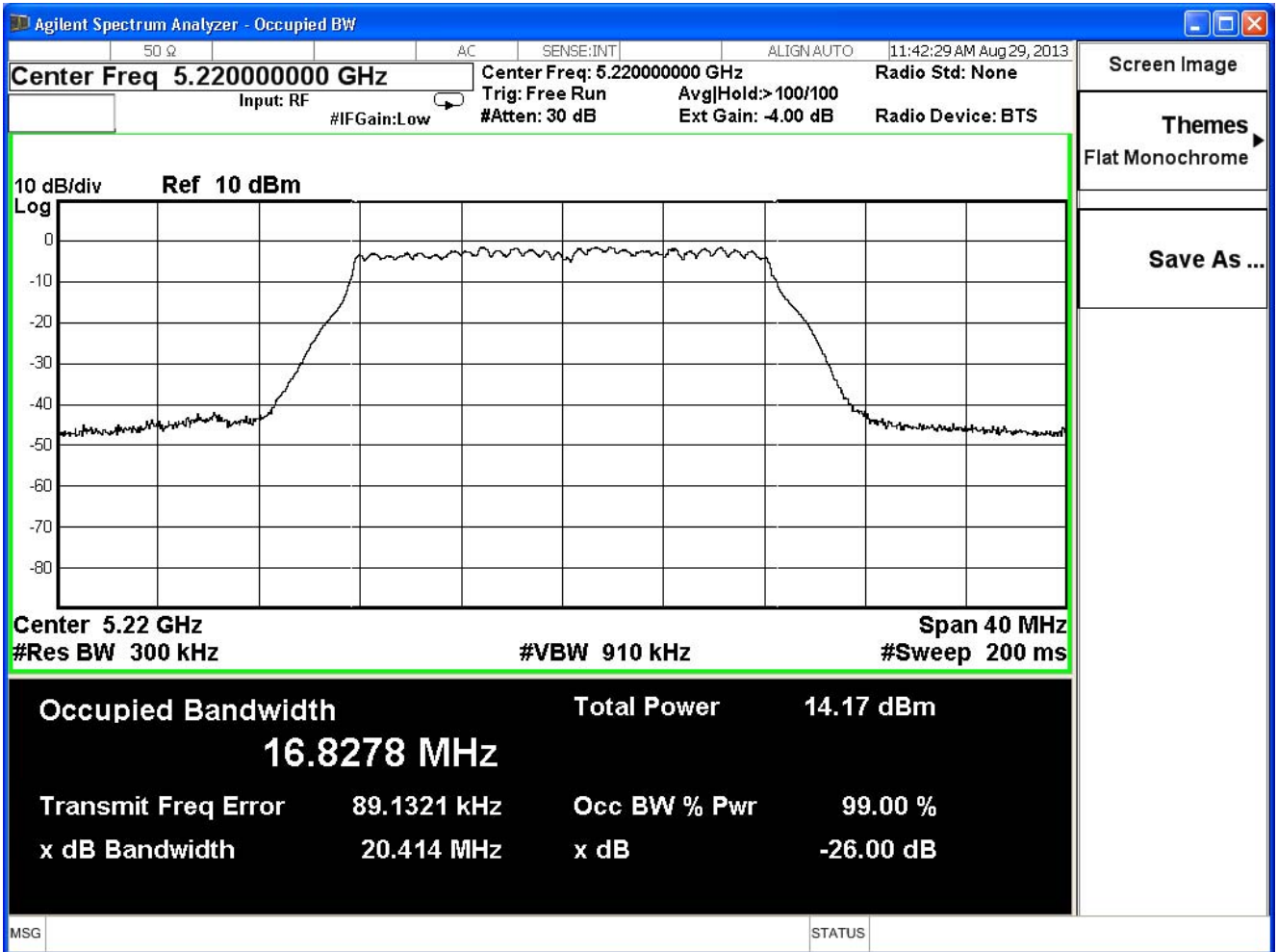
802.11a (ANT 2)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.47	16.84	--	NA
44	5220	20.41	16.82	--	NA
48	5240	20.42	16.82	--	NA

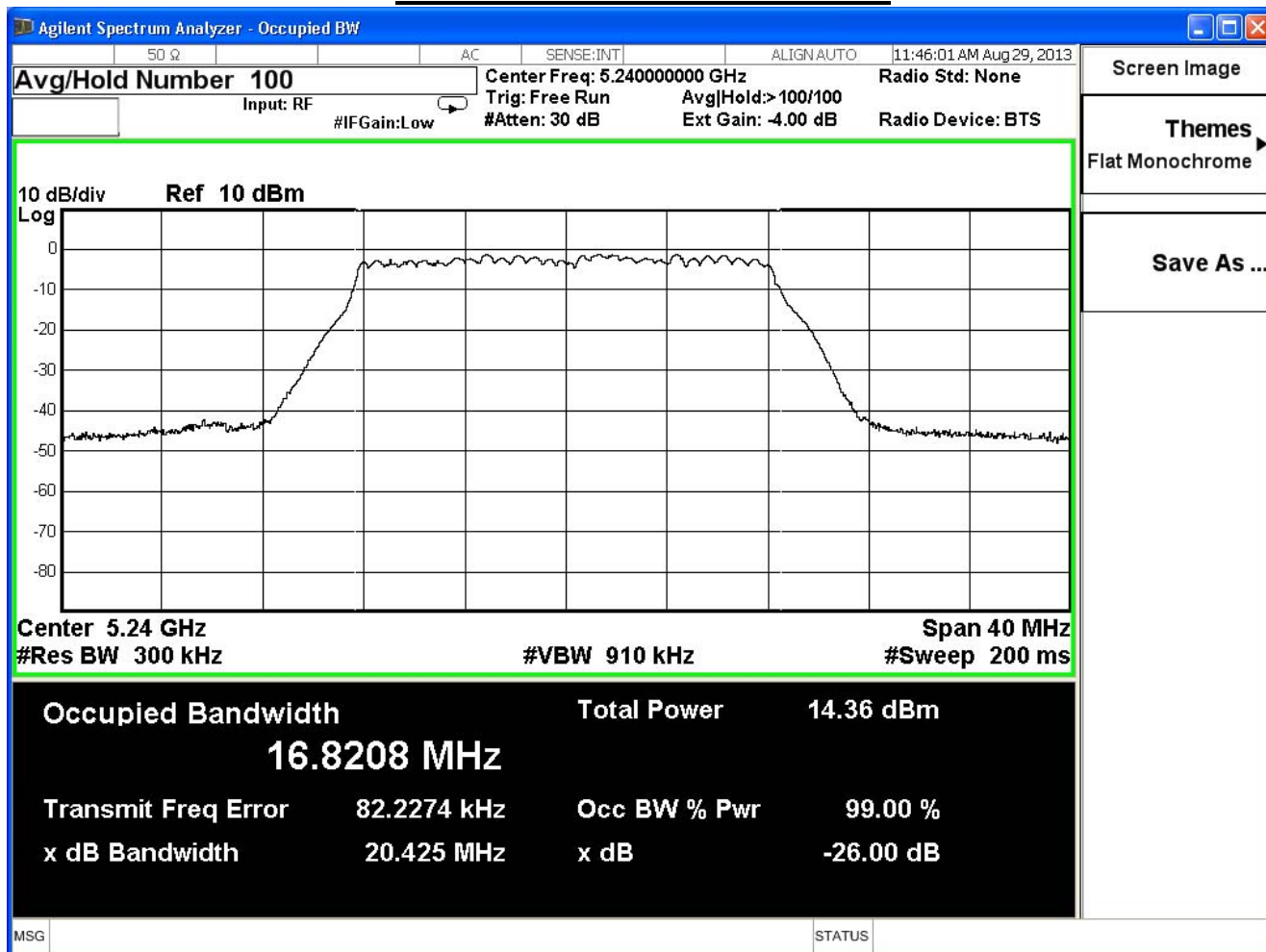
99% & 26dB Bandwidth – Channel 36



99% & 26dB Bandwidth – Channel 44



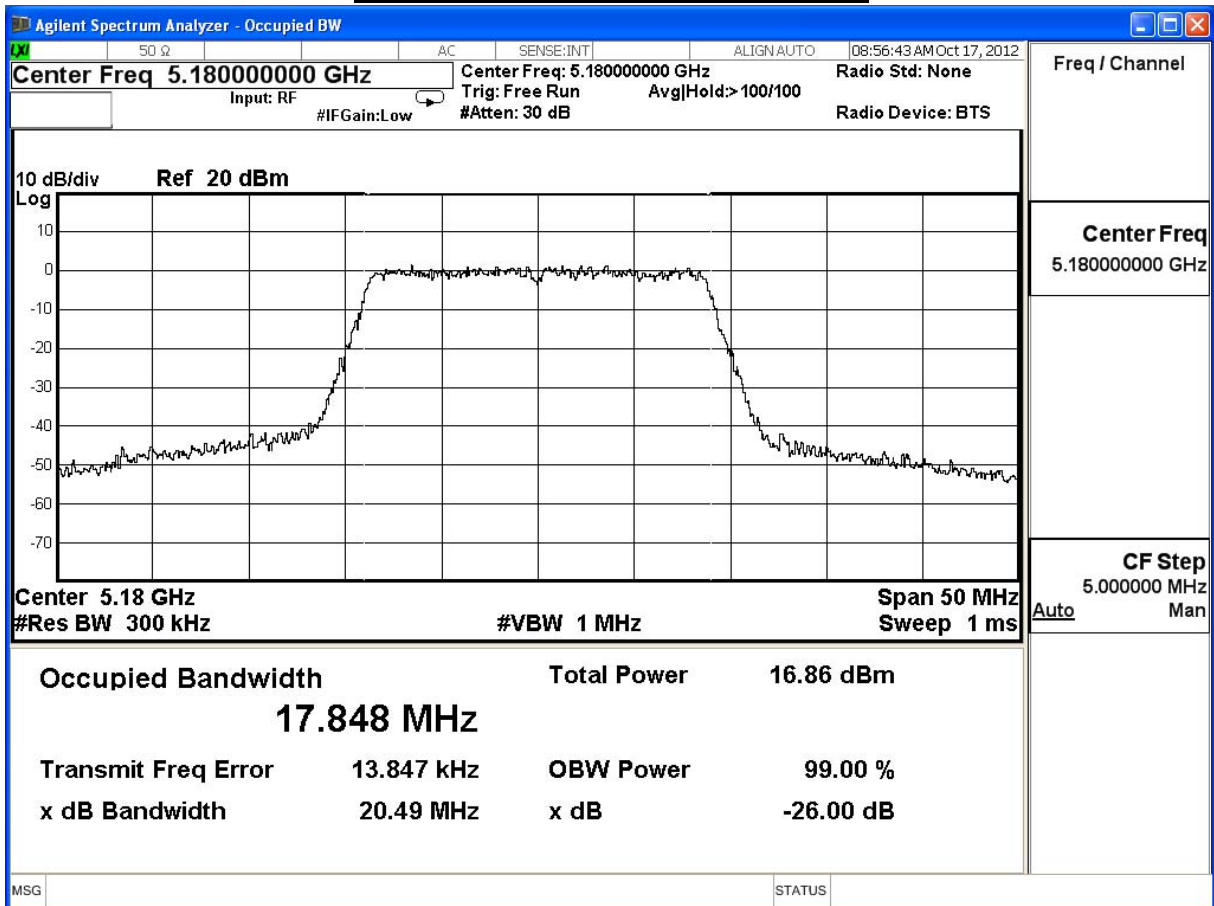
99% & 26dB Bandwidth – Channel 48



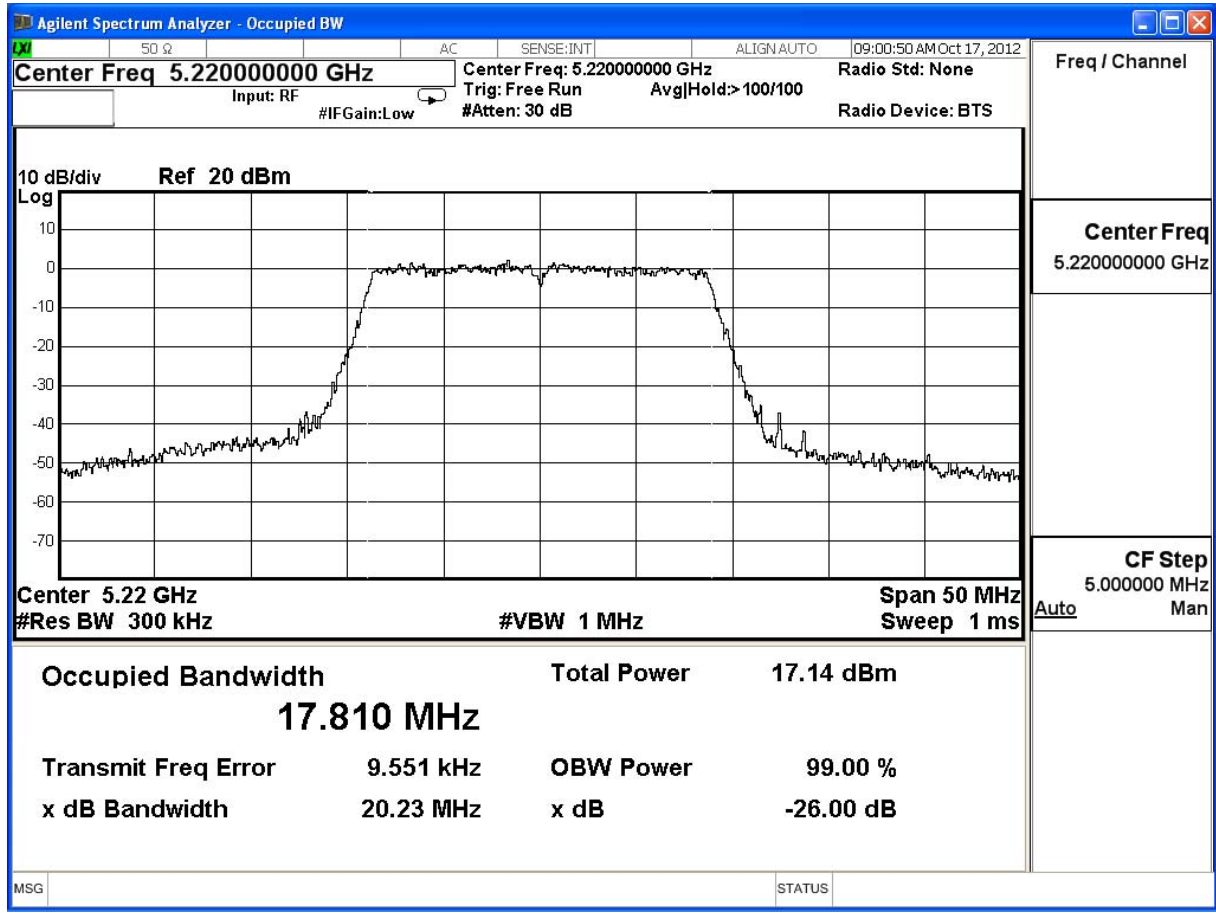
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

802.11n_20M(ANT 0)					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.49	17.84	--	NA
44	5220	20.23	17.81	--	NA
48	5240	20.51	17.85	--	NA

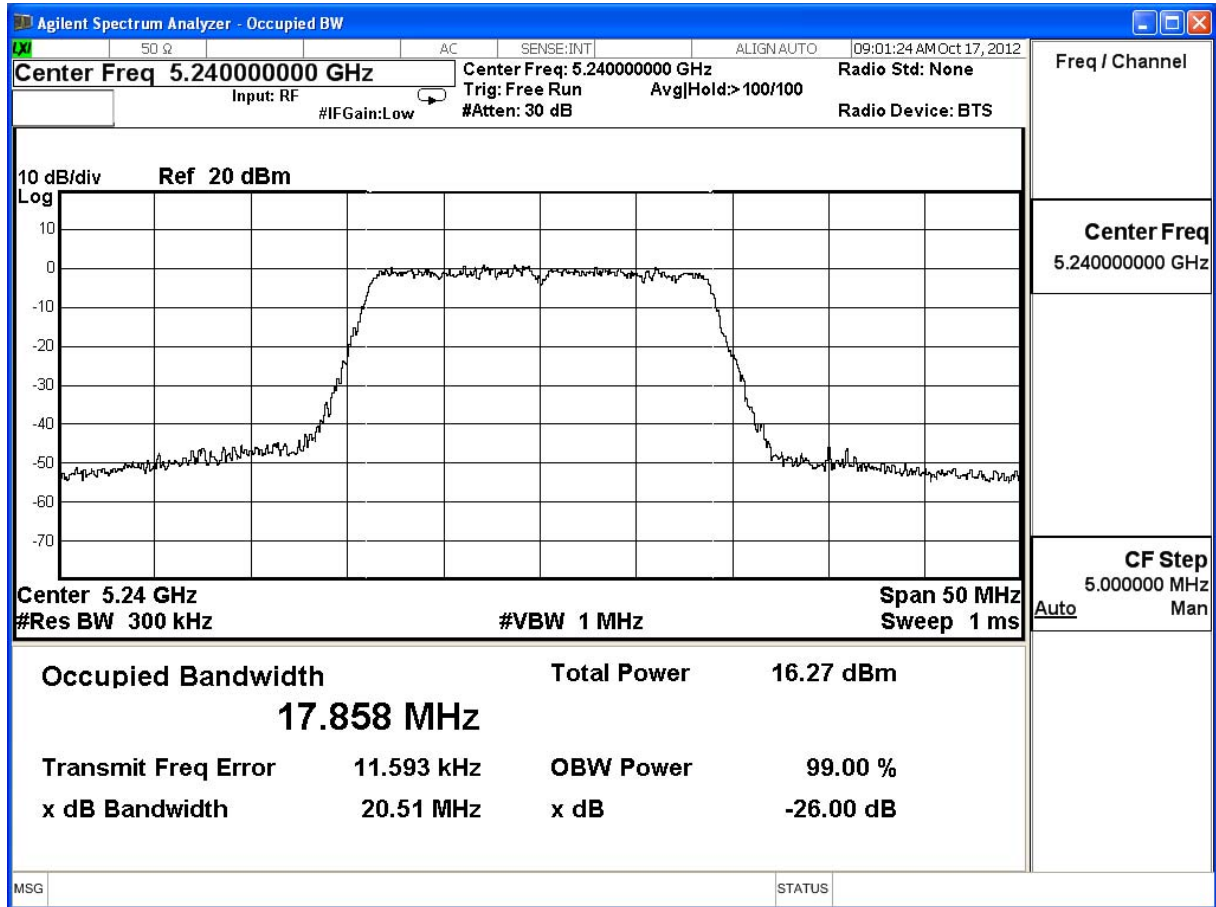
99% & 26dB Bandwidth – Channel 36



99% & 26dB Bandwidth – Channel 44



99% & 26dB Bandwidth – Channel 48

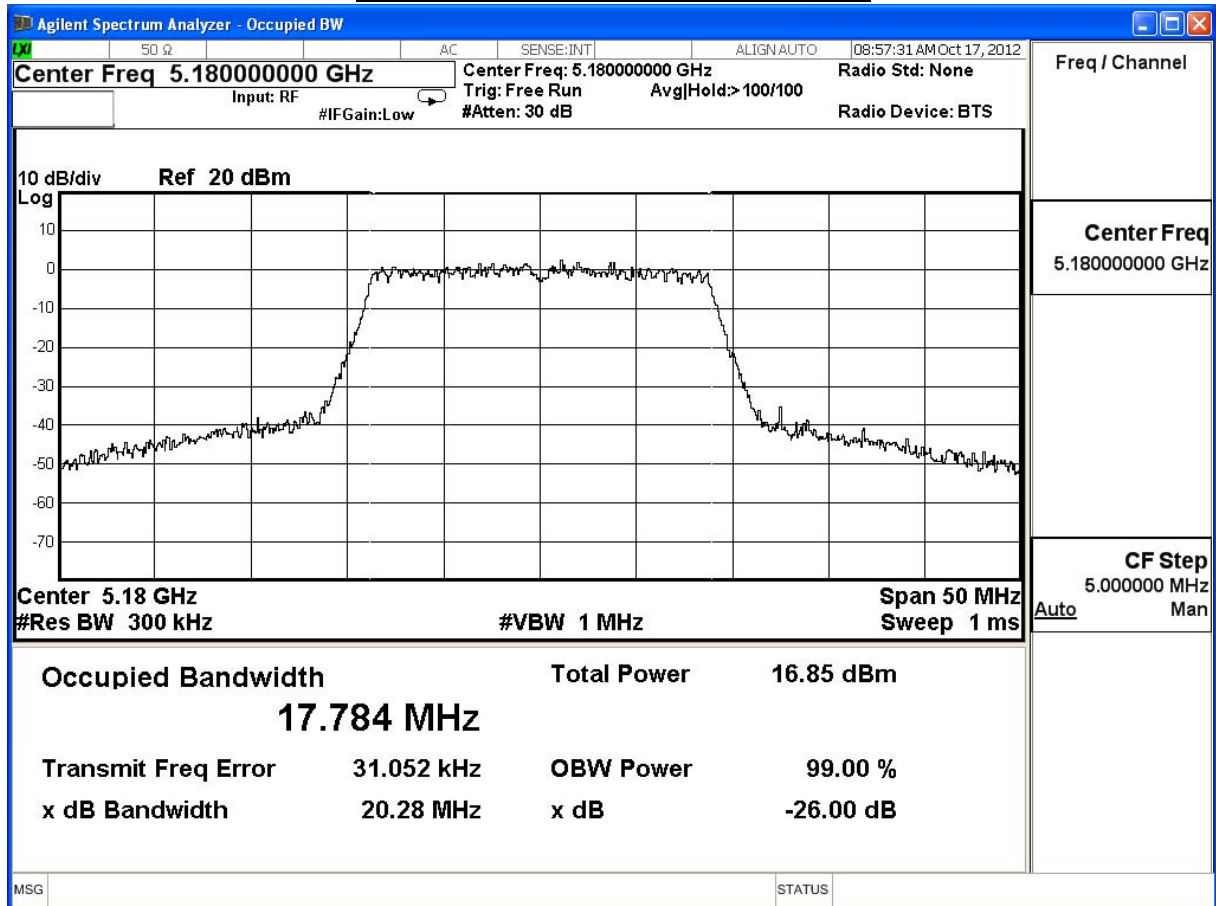


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

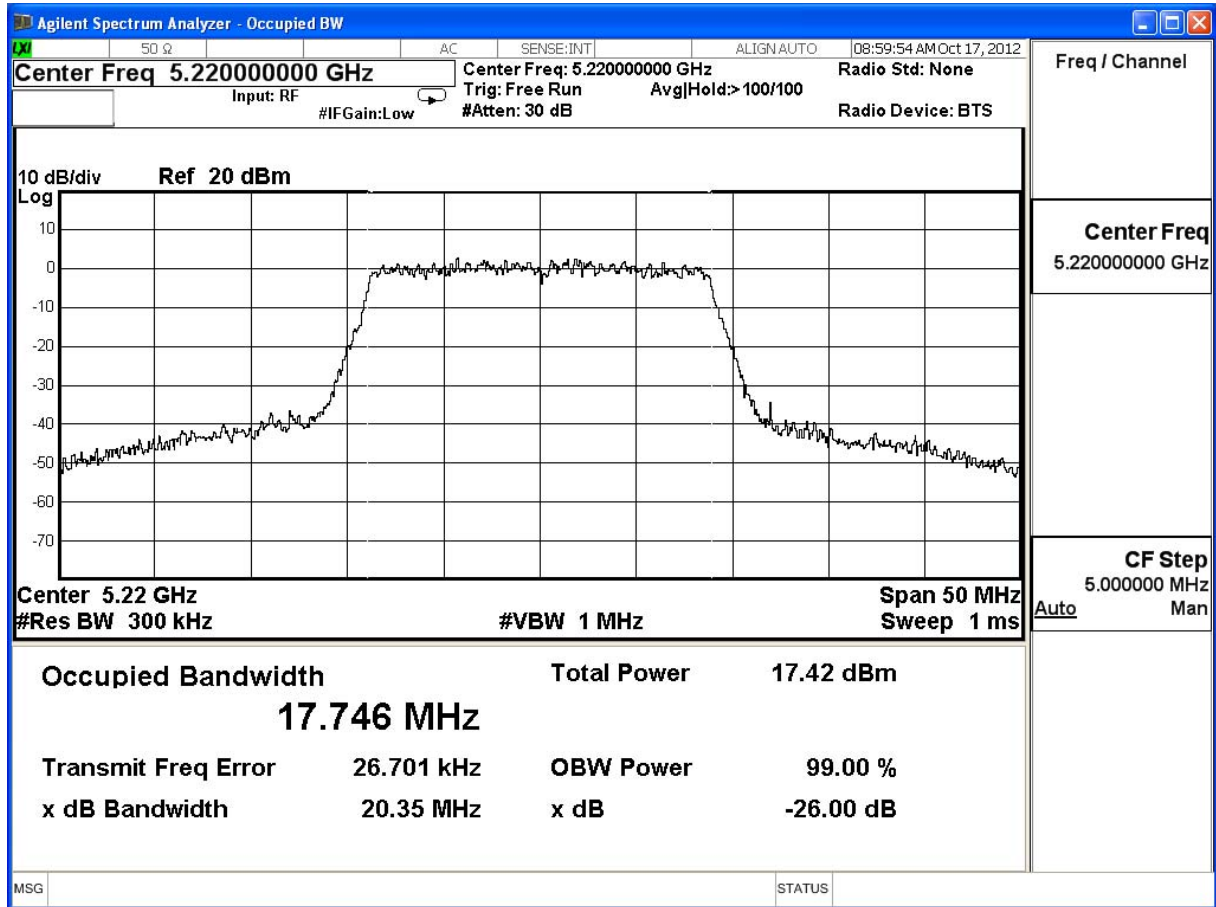
802.11n_20M(ANT 1)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.28	17.78	--	NA
44	5220	20.35	17.74	--	NA
48	5240	20.12	17.74	--	NA

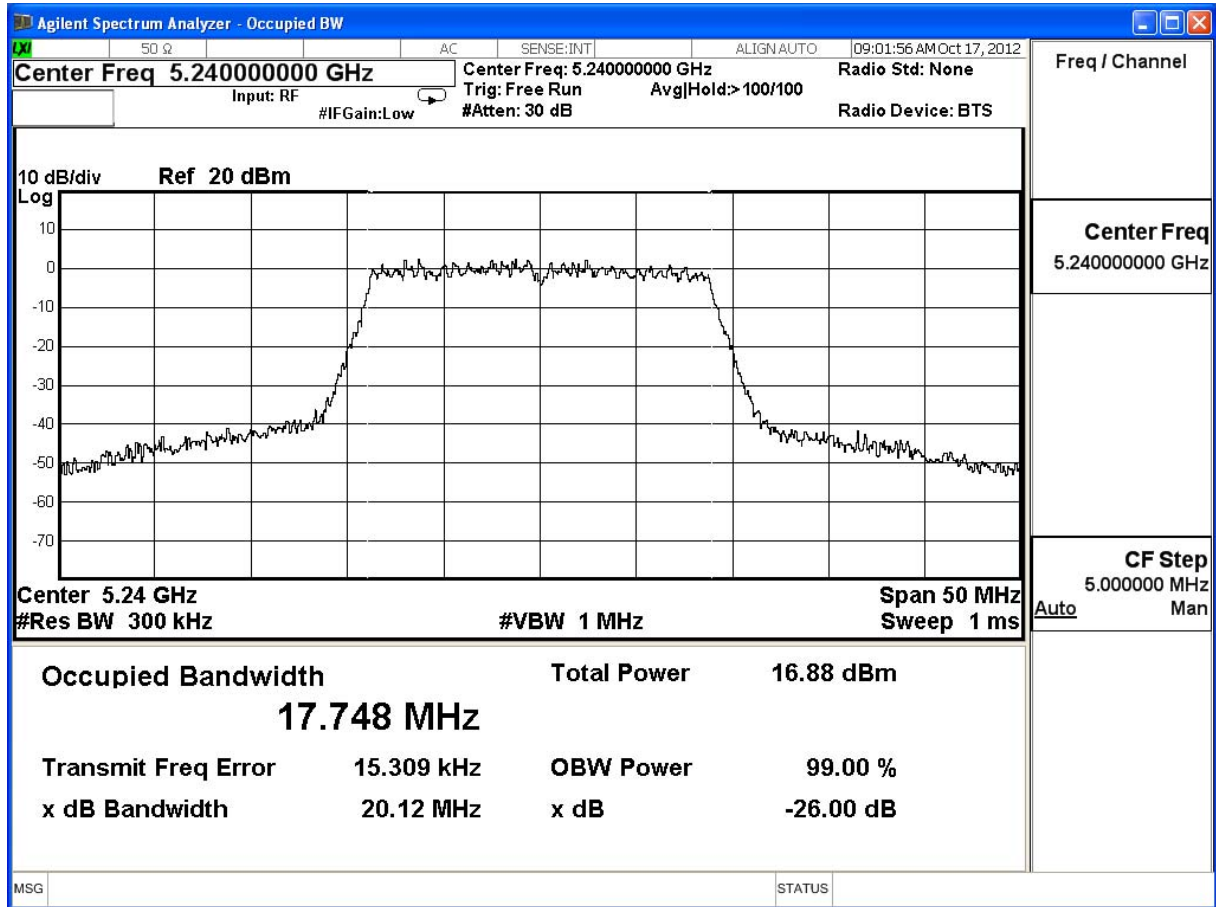
99% & 26dB Bandwidth – Channel 36



99% & 26dB Bandwidth – Channel 44



99% & 26dB Bandwidth – Channel 48

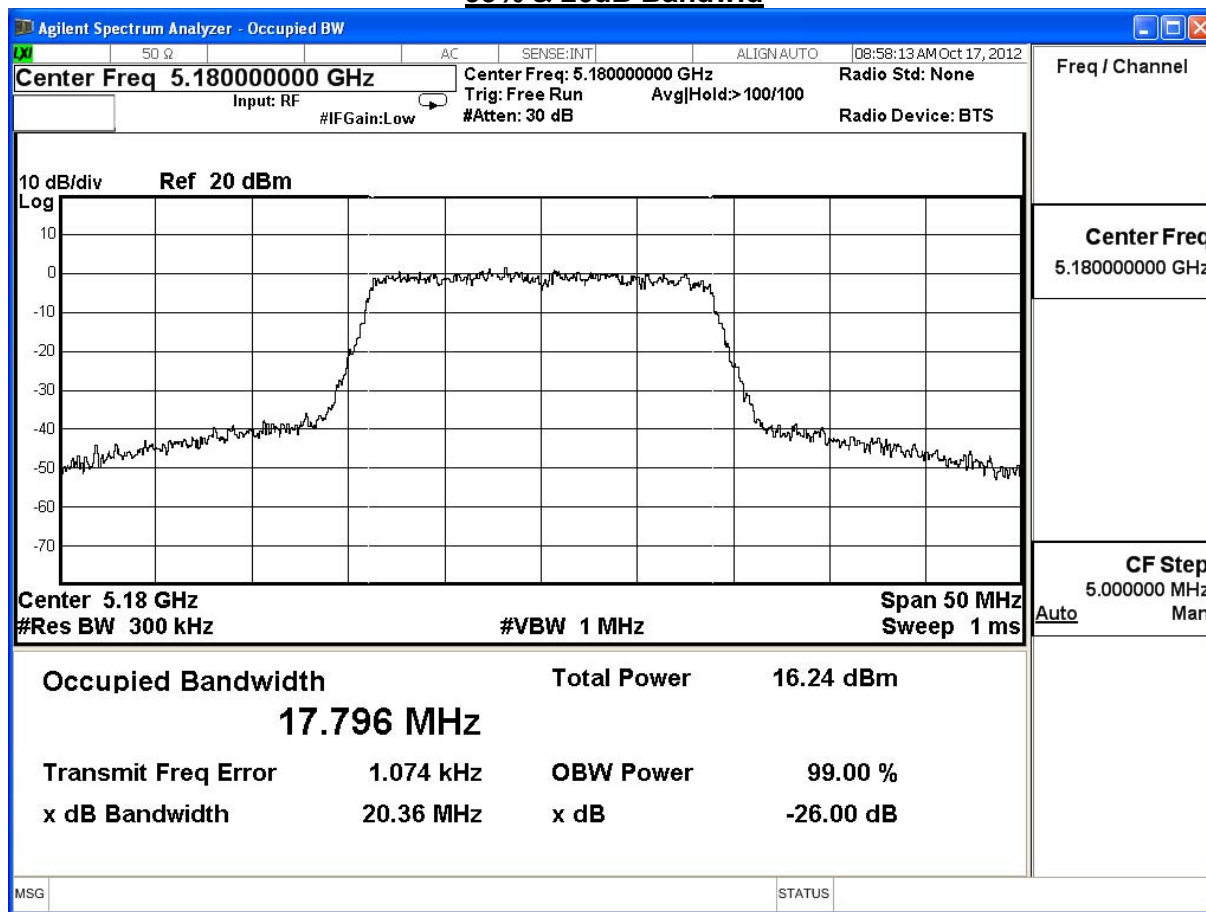


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

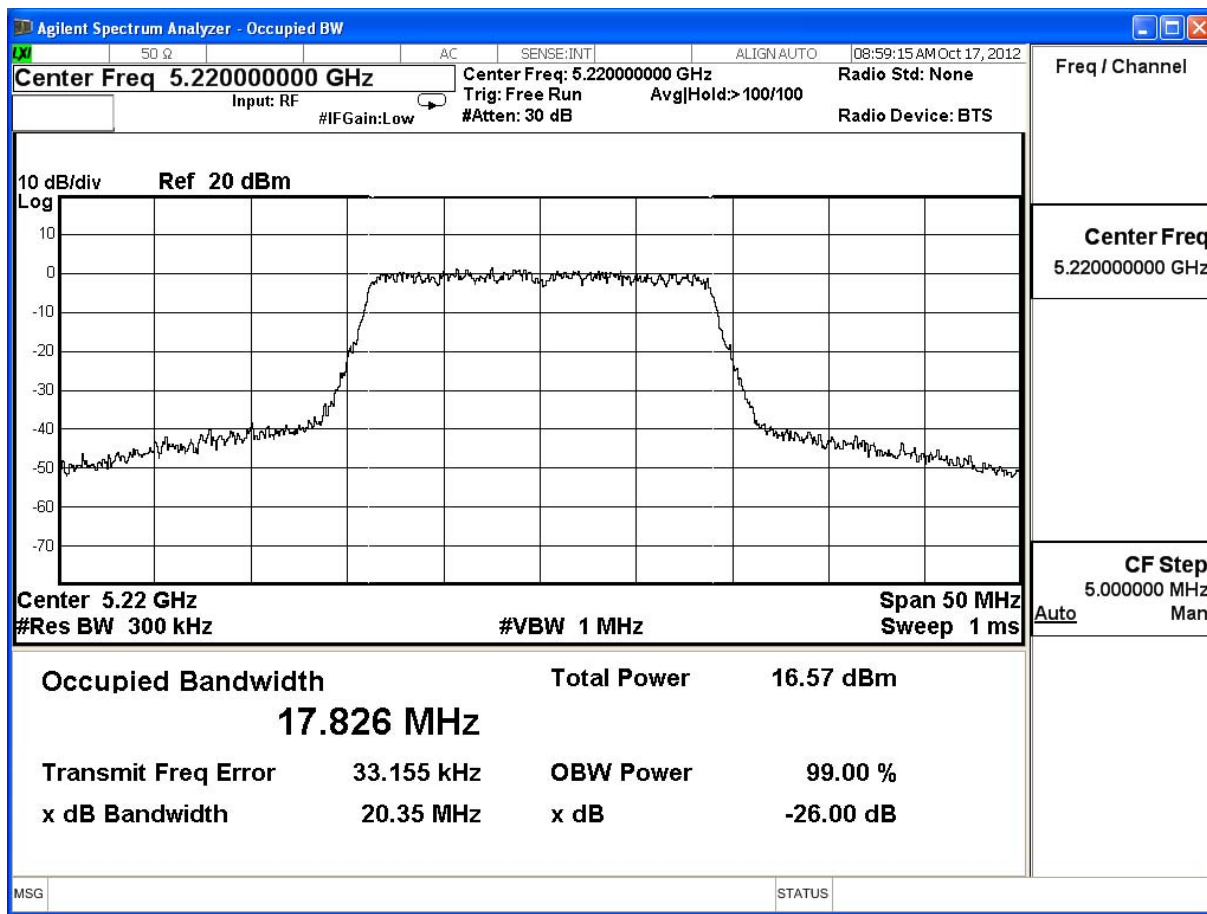
802.11n_20M(ANT 2)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
36	5180	20.36	17.79	--	NA
44	5220	20.35	17.82	--	NA
48	5240	20.38	17.82	--	NA

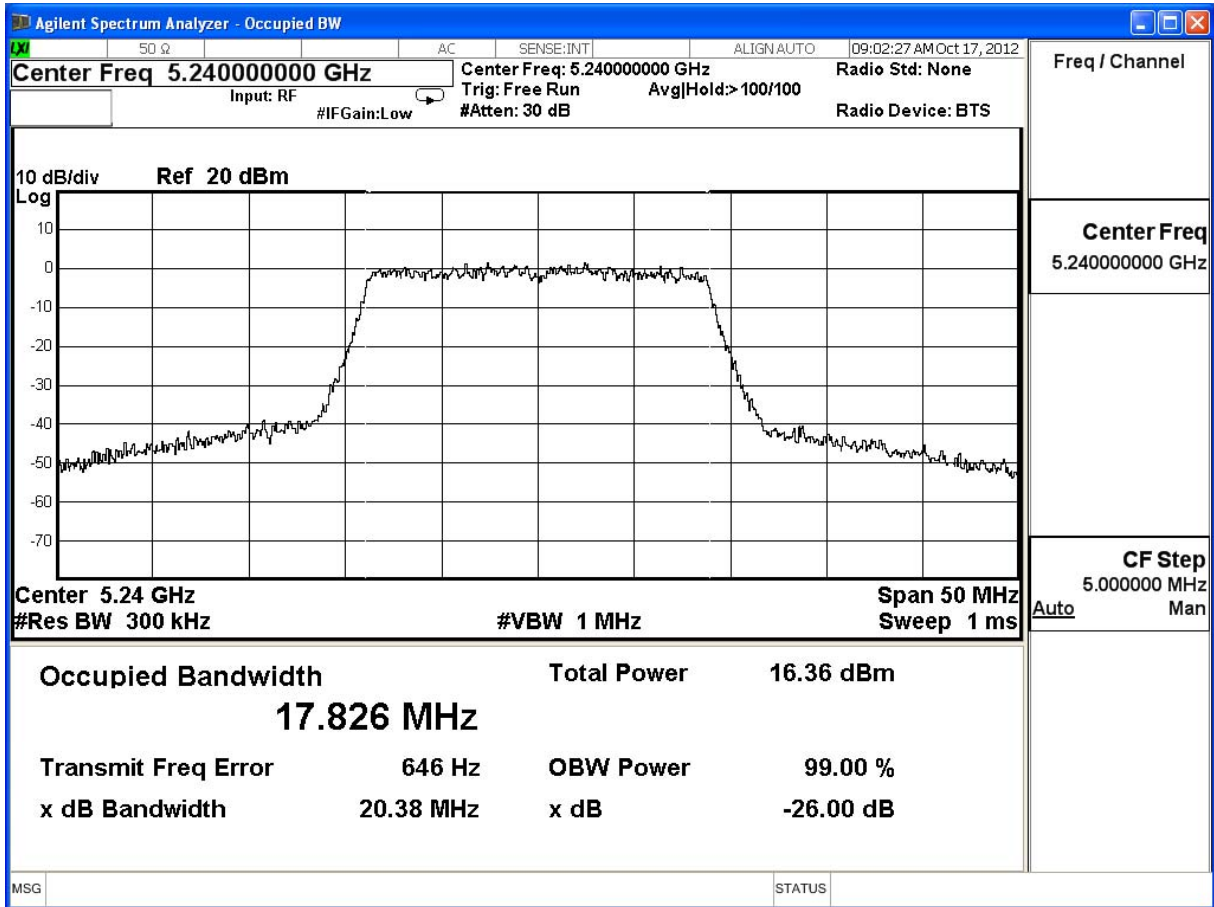
99% & 26dB Bandwid



99% & 26dB Bandwidth – Channel 44



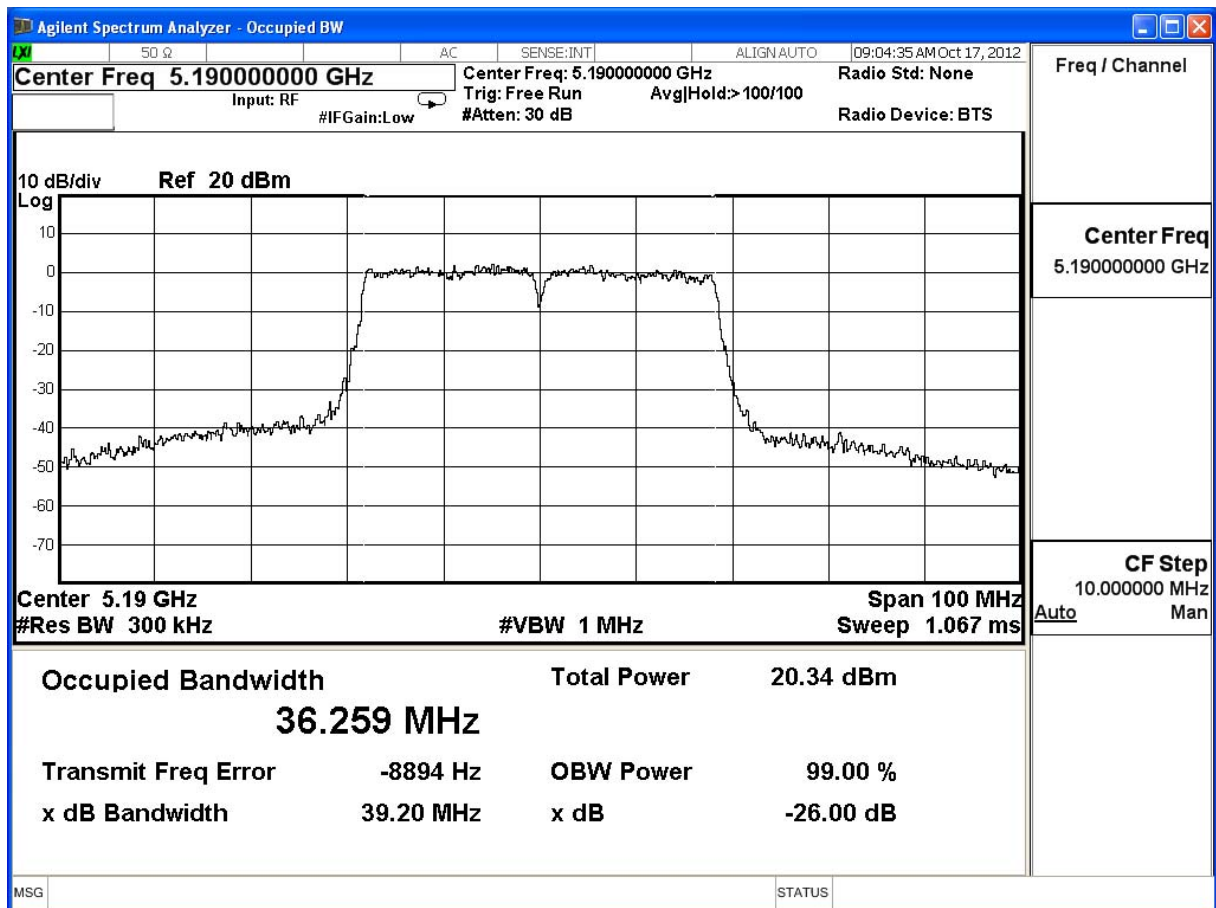
99% & 26dB Bandwidth – Channel 48



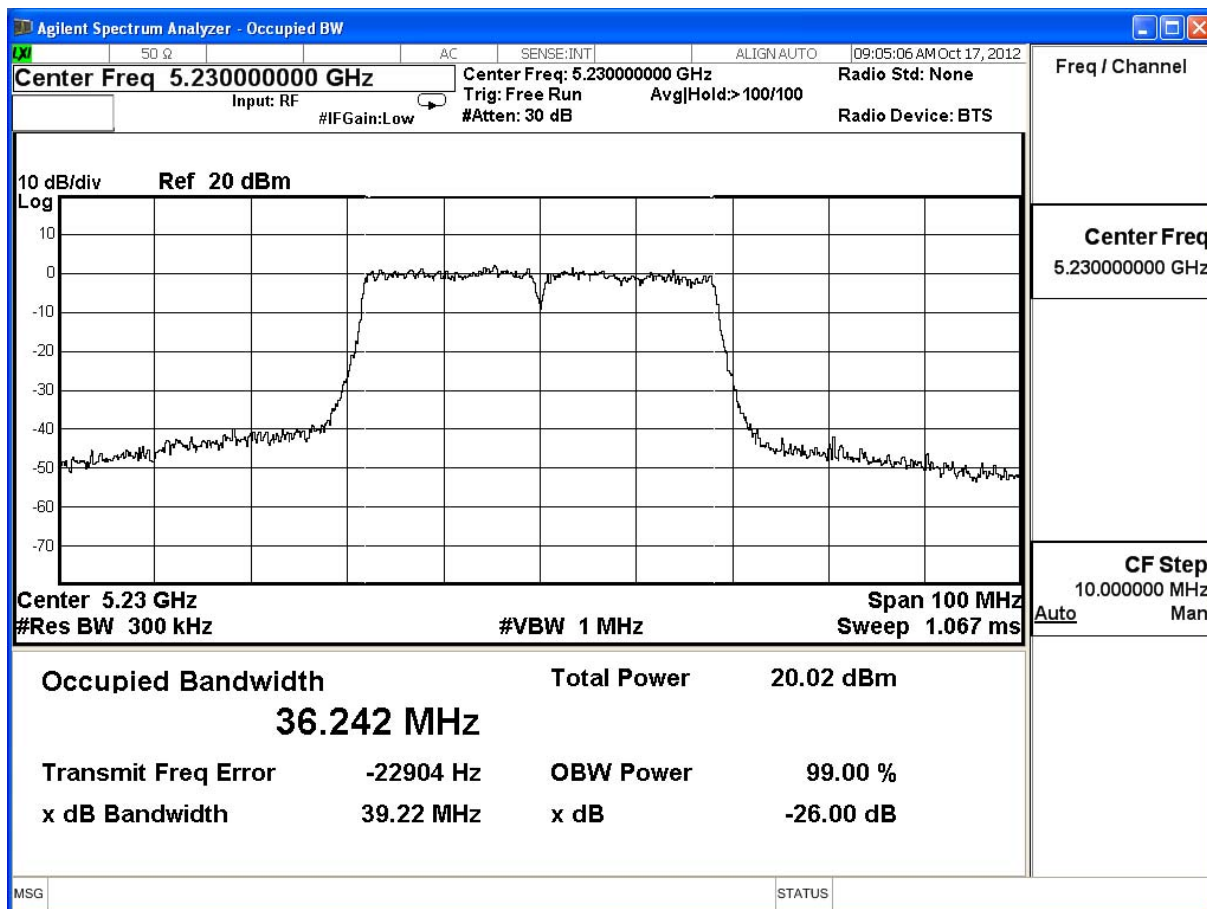
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

802.11n_40M(ANT 0)					
Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
38	5190	39.20	36.25	--	NA
46	5230	39.22	36.24	--	NA

99% & 26dB Bandwidth – Channel 38



99% & 26dB Bandwidth – Channel 46

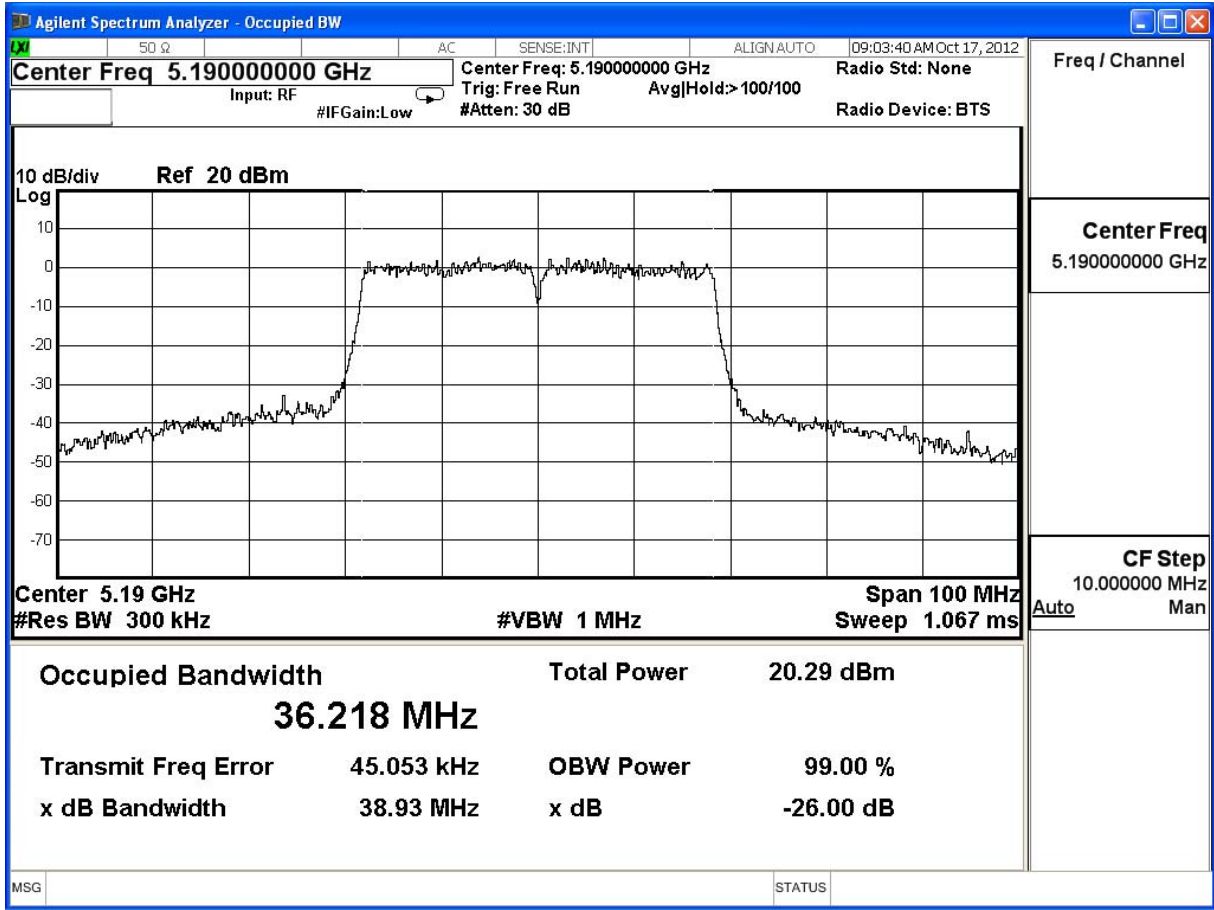


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

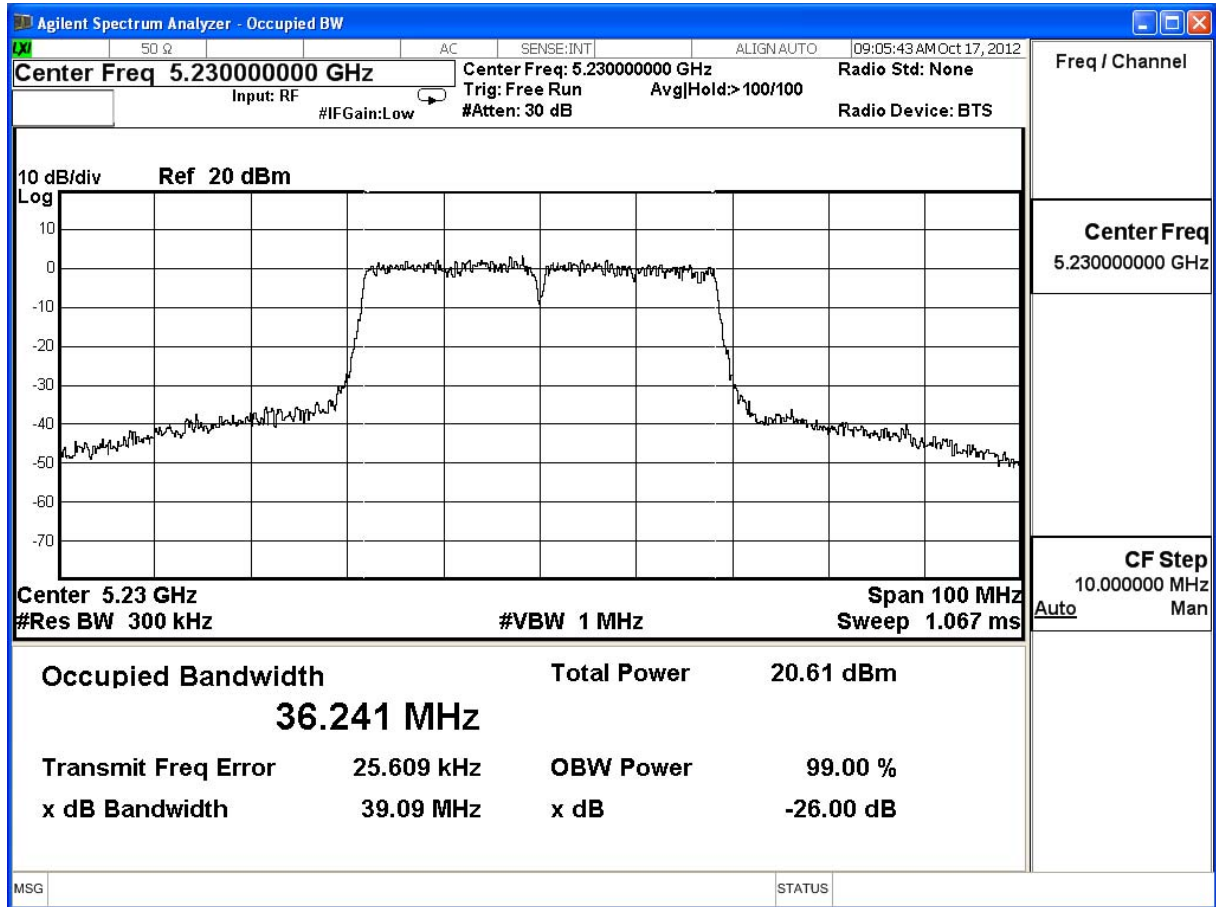
802.11n_40M(ANT 1)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
38	5190	38.93	36.21	--	NA
46	5230	39.09	36.24	--	NA

99% & 26dB Bandwidth – Channel 38



99% & 26dB Bandwidth – Channel 46

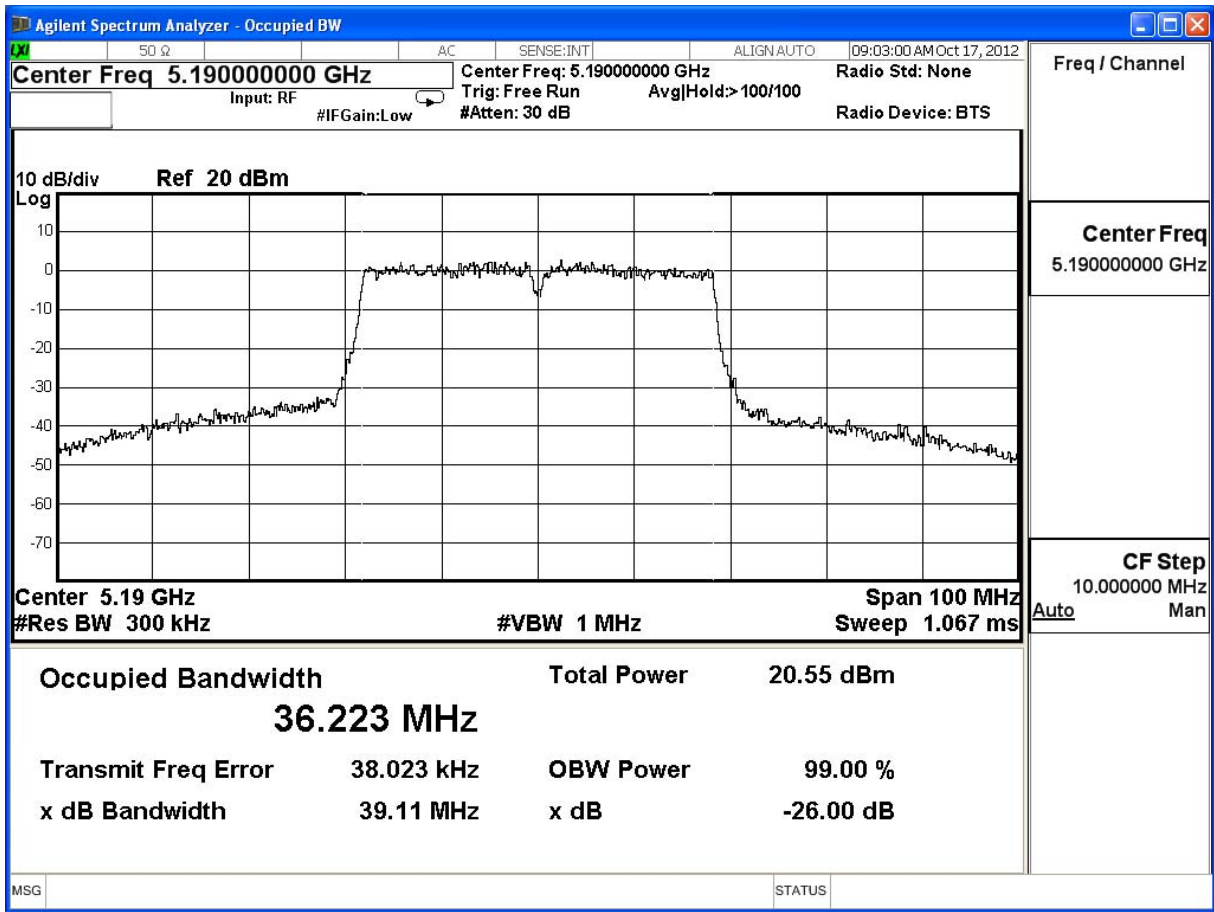


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

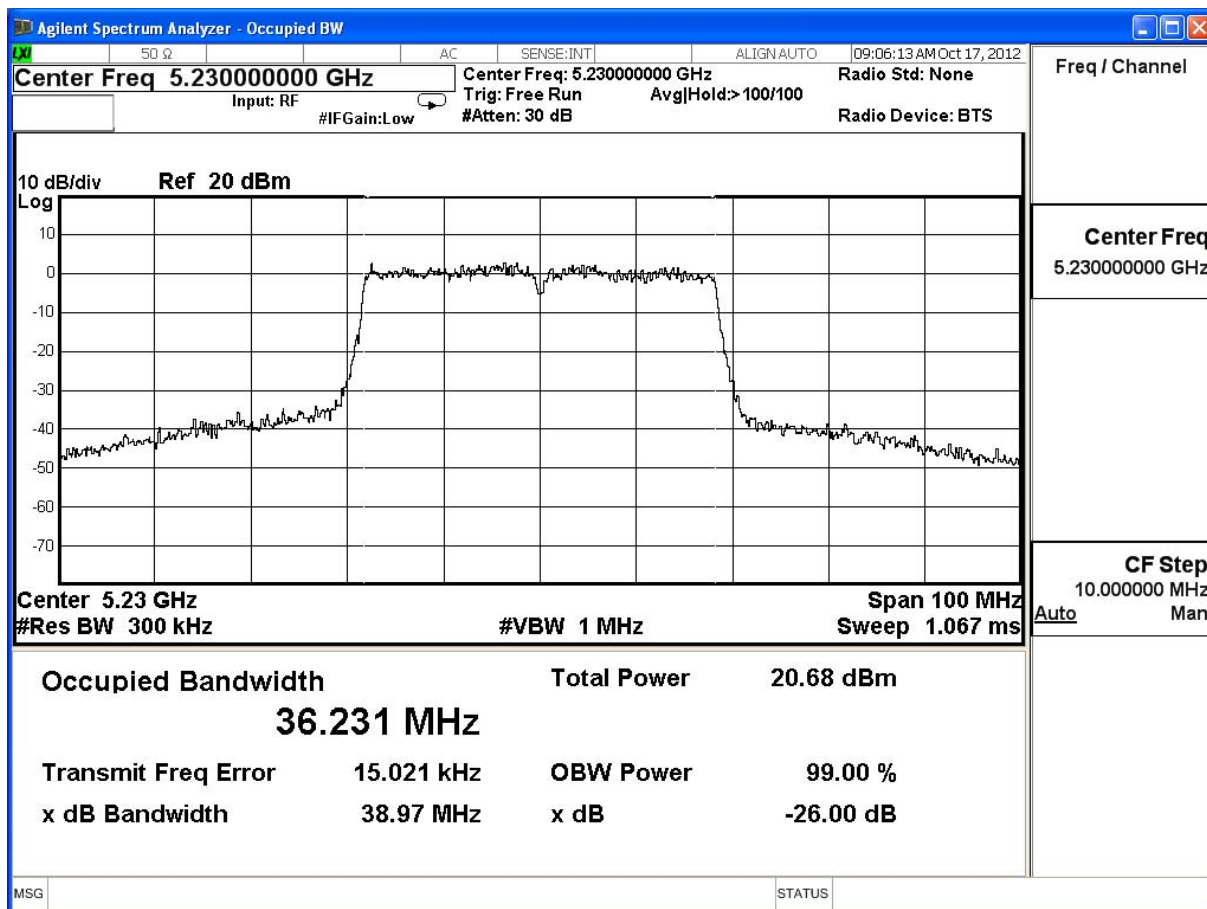
802.11n_40M(ANT 2)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
38	5190	39.11	36.22	--	NA
46	5230	38.97	36.23	--	NA

99% & 26dB Bandwidth – Channel 38



99% & 26dB Bandwidth – Channel 46

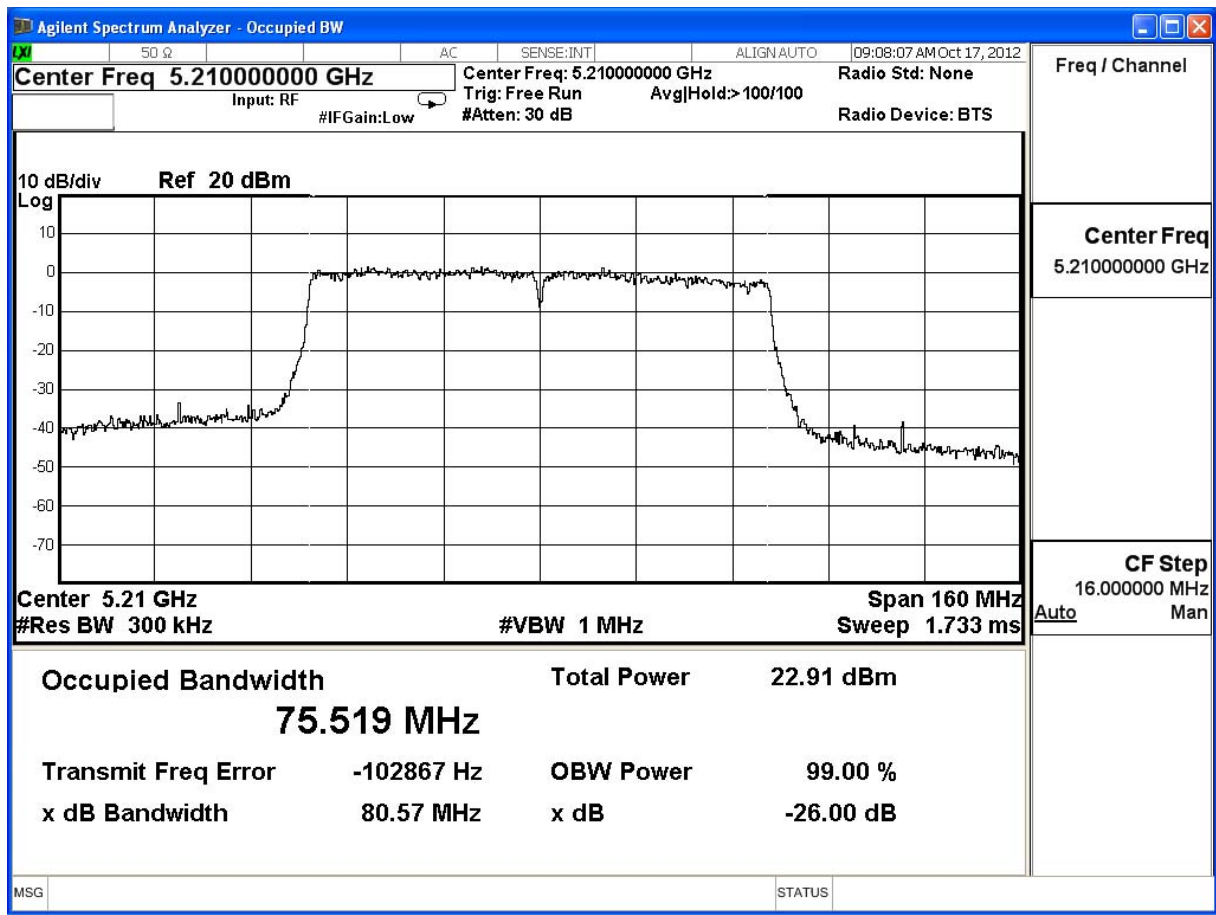


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

802.11ac_80M(ANT 0)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
42	5210	80.57	75.51	--	NA

99% & 26dB Bandwidth – Channel 42

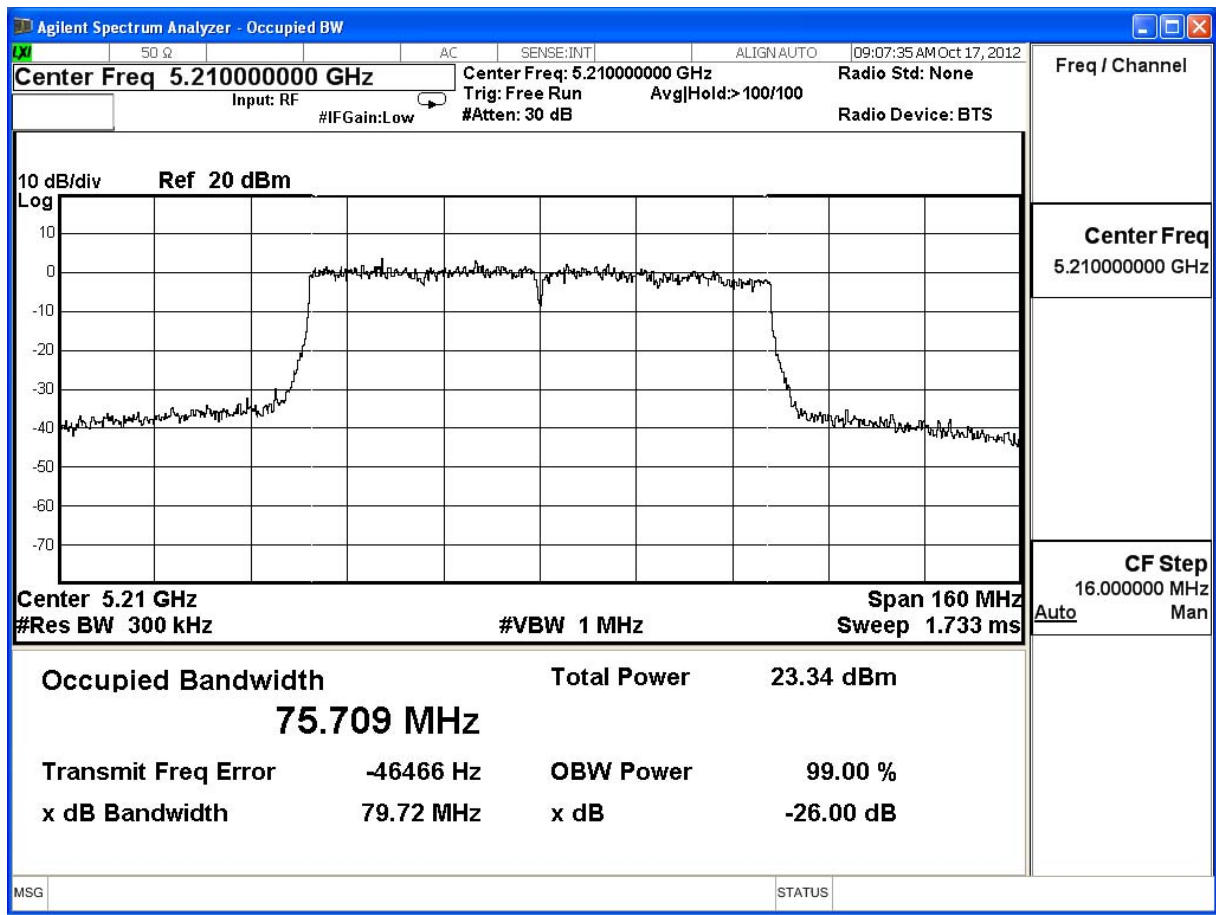


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

802.11ac_80M(ANT 1)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
42	5210	79.72	75.70	--	NA

99% & 26dB Bandwidth – Channel 42

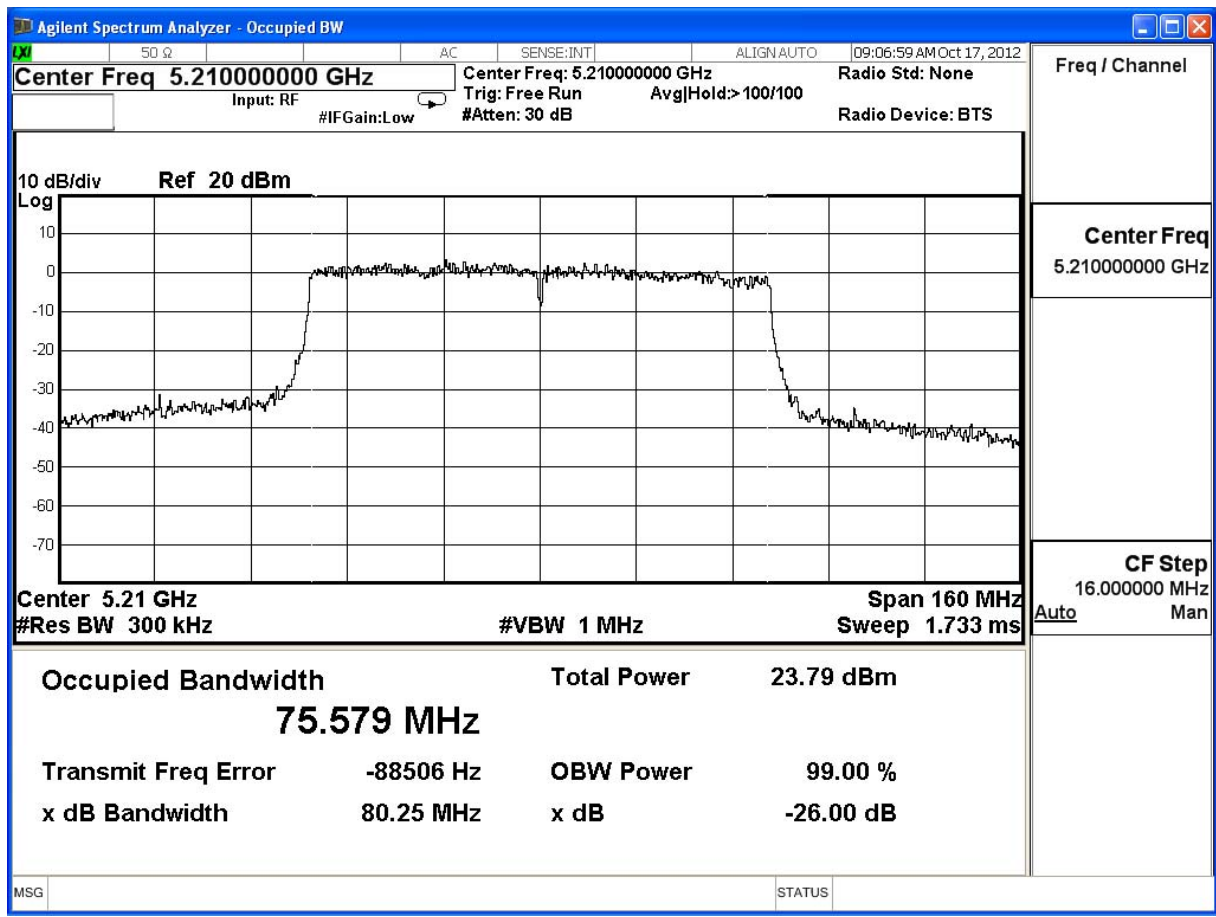


Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	99% & 26dB Bandwidth		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2012/10/17	Test Site	SR7

802.11ac_80M(ANT 2)

Channel No.	Frequency (MHz)	26dB BW (MHz)	99 % OBW (MHz)	Required Limit (MHz)	Result
42	5210	80.25	75.57	--	NA

99% & 26dB Bandwidth – Channel 42



4. Peak Transmit Output

4.1. Test Equipment

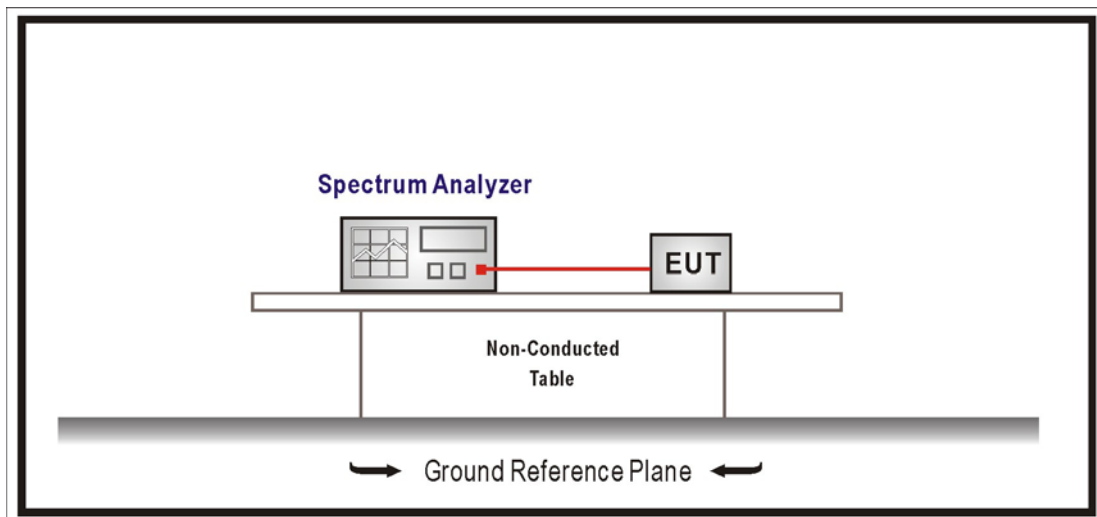
The following test equipments are used during the radiated emission tests:

Peak Transmit Output / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A-EXA	US47140172	2014/08/05

Note: 1. All equipments that need to calibrate are with calibration period of 1 year.

4.2. Test Setup



4.3. Limits

1. For the band 5.15-5.25 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50 mW or $4 \text{ dBm} + 10\log B$, where B is the 26dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
2. For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10\log B$, where B is the 26dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.
3. For the band 5.725-5.825 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 1W or $17 \text{ dBm} + 10\log B$, where B is the 26dB emission bandwidth in MHz. If transmitting antenna of directional gain greater than 6 dBi are used, the peak transmit power shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

4.4. Test Procedure

The EUT was setup to ANSI C63.4, 2009; tested to U-NII test procedure of March 2012 KDB 789033 for compliance to FCC 47CFR Subpart E requirements. The Method SA-1 of the Maximum conducted output power was used.

Set RBW=1MHz, VBW=3MHz with RMS detector and trace average 100 traces in power averaging mode. Set span to encompass the entire emission bandwidth (EBW) of the signal. Compute power by integrating the spectrum across the 26 dB EBW of the signal.

4.5. Uncertainty

The measurement uncertainty is defined as $\pm 1.27 \text{ dB}$

4.6. Test Result

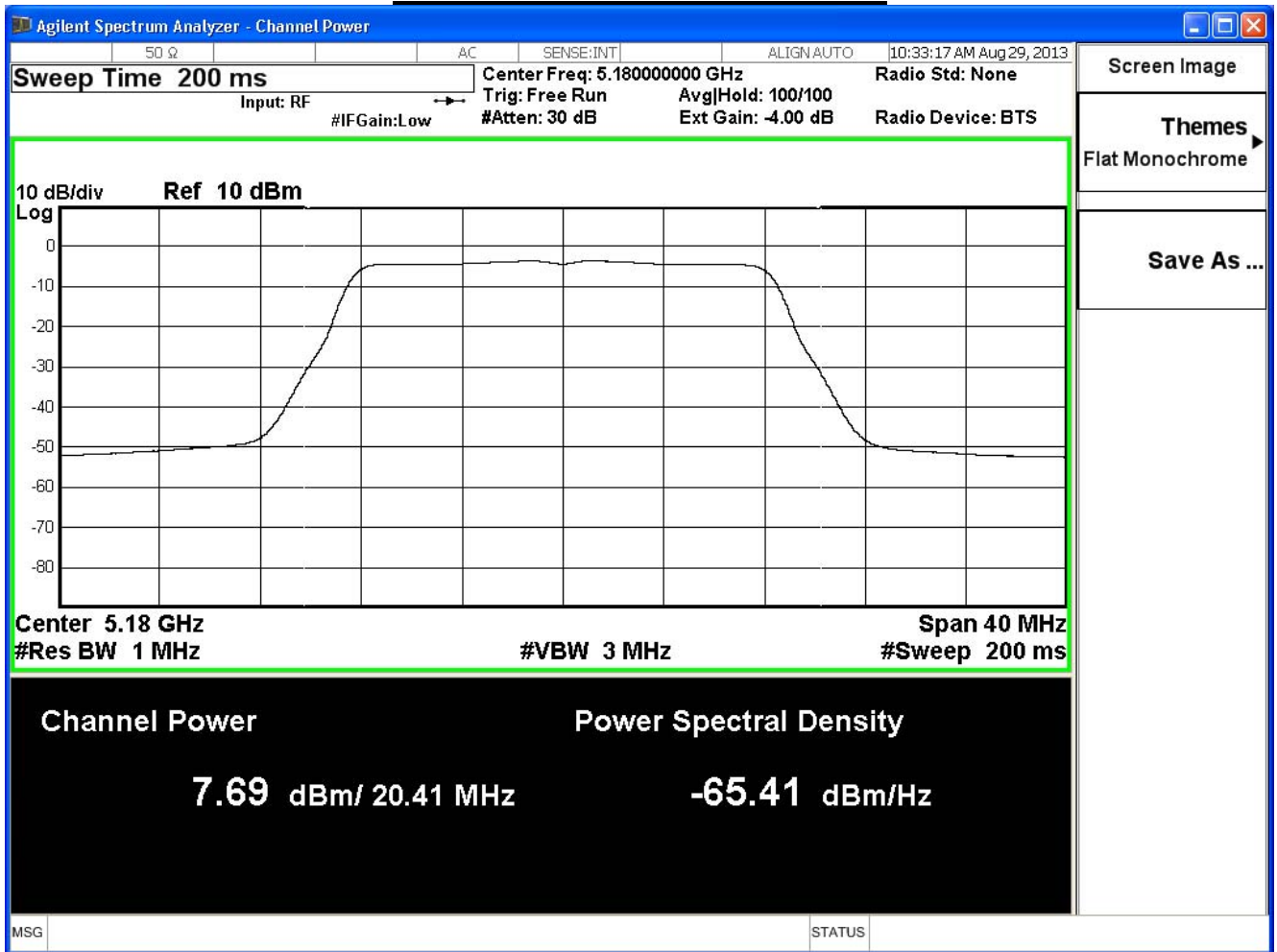
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/29	Test Site	SR7

802.11a (ANT 0)						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.41	7.69	≤17	≤17.10	Pass
44	5220	20.46	7.94	≤ 17	≤17.03	Pass
48	5240	20.42	7.89	≤ 17	≤17.05	Pass

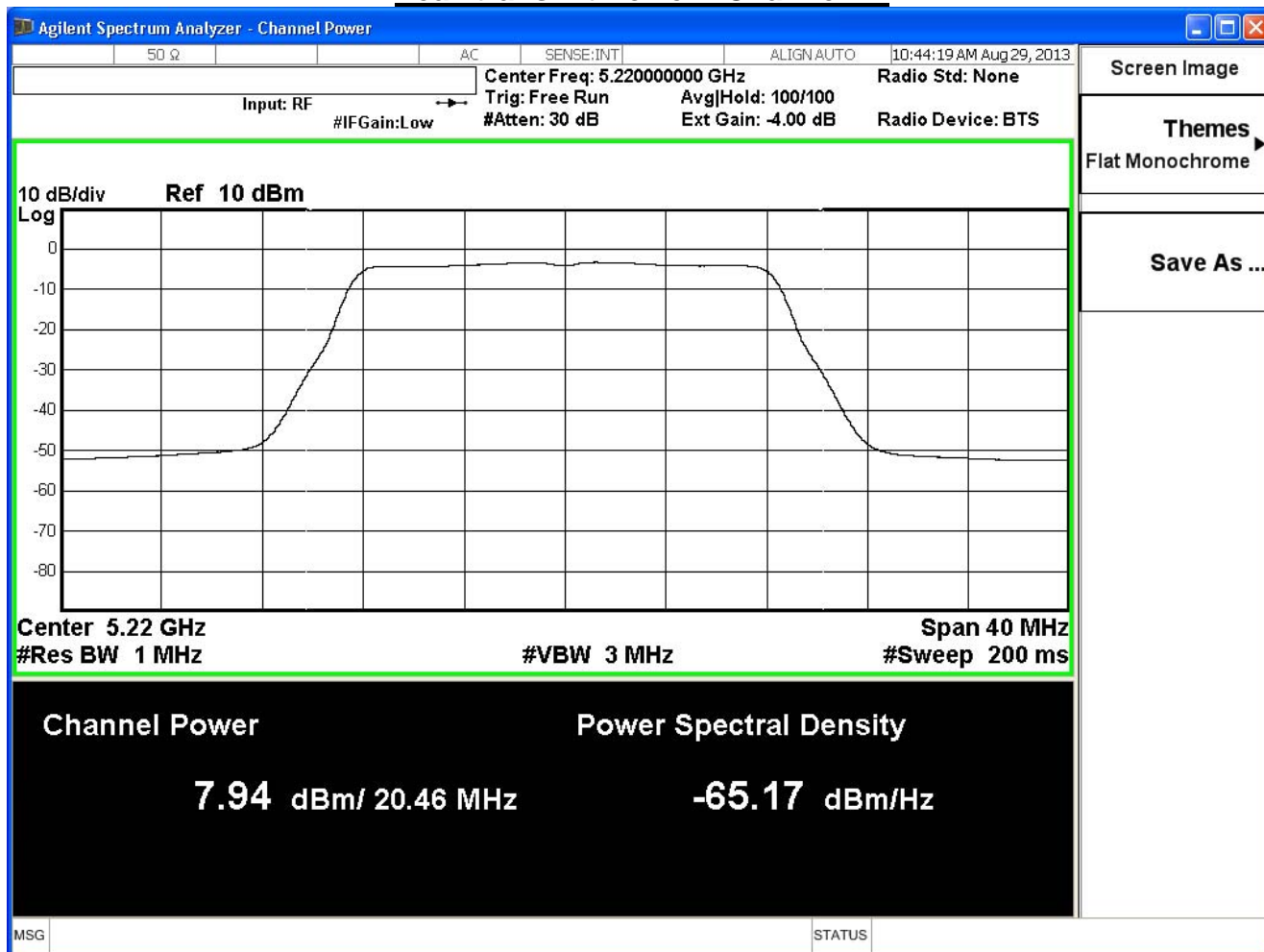
The worst emission of data rate is 6 Mbps.

Peak Power Output (dBm)									
Channel No	Frequency (MHz)	Data Rate							Required Limit
		6	12	18	24	36	48	54	
36	5180	7.69	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	7.94	7.93	7.92	7.91	7.90	7.89	7.88	
48	5240	7.89	--	--	--	--	--	--	

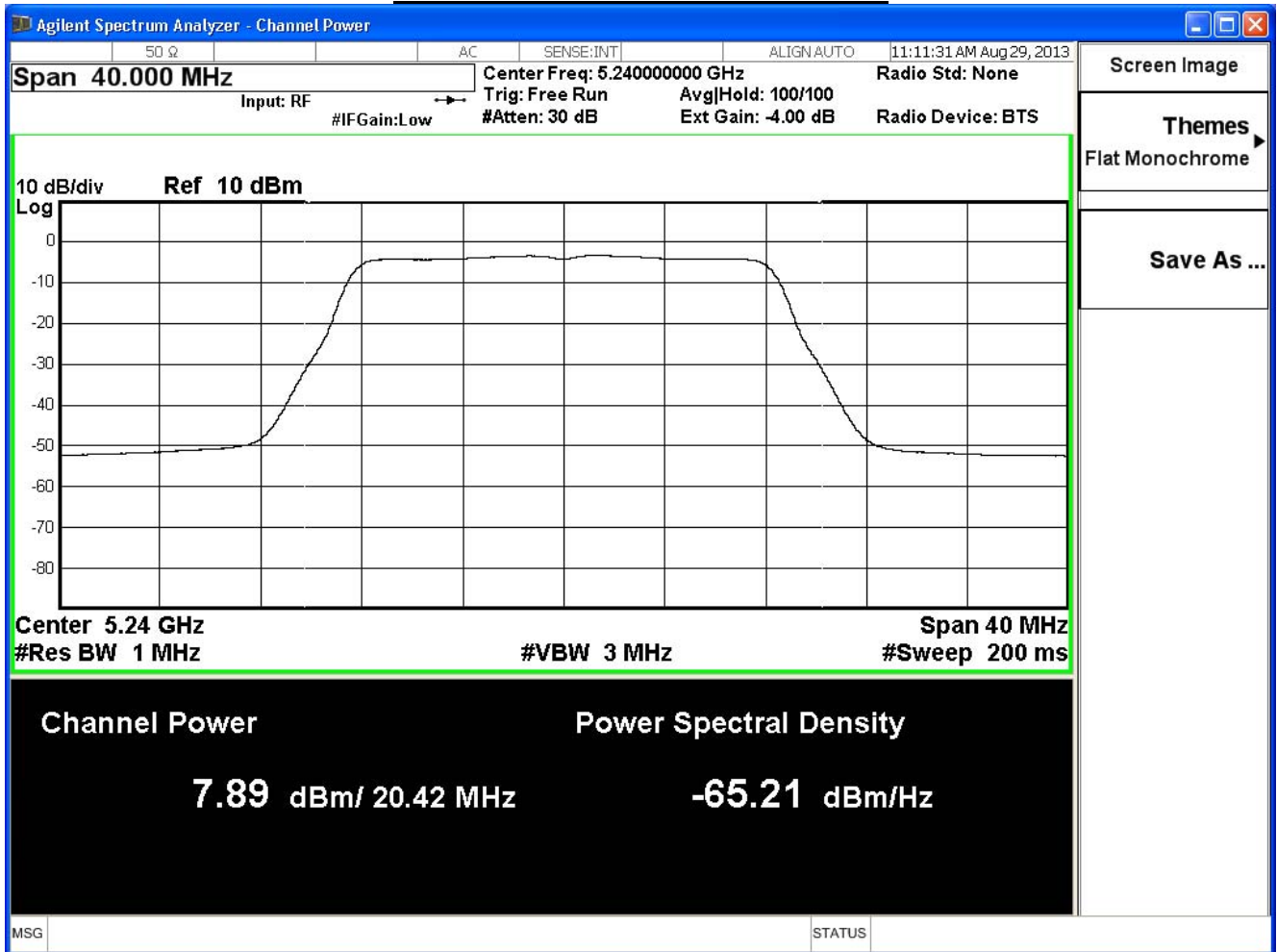
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



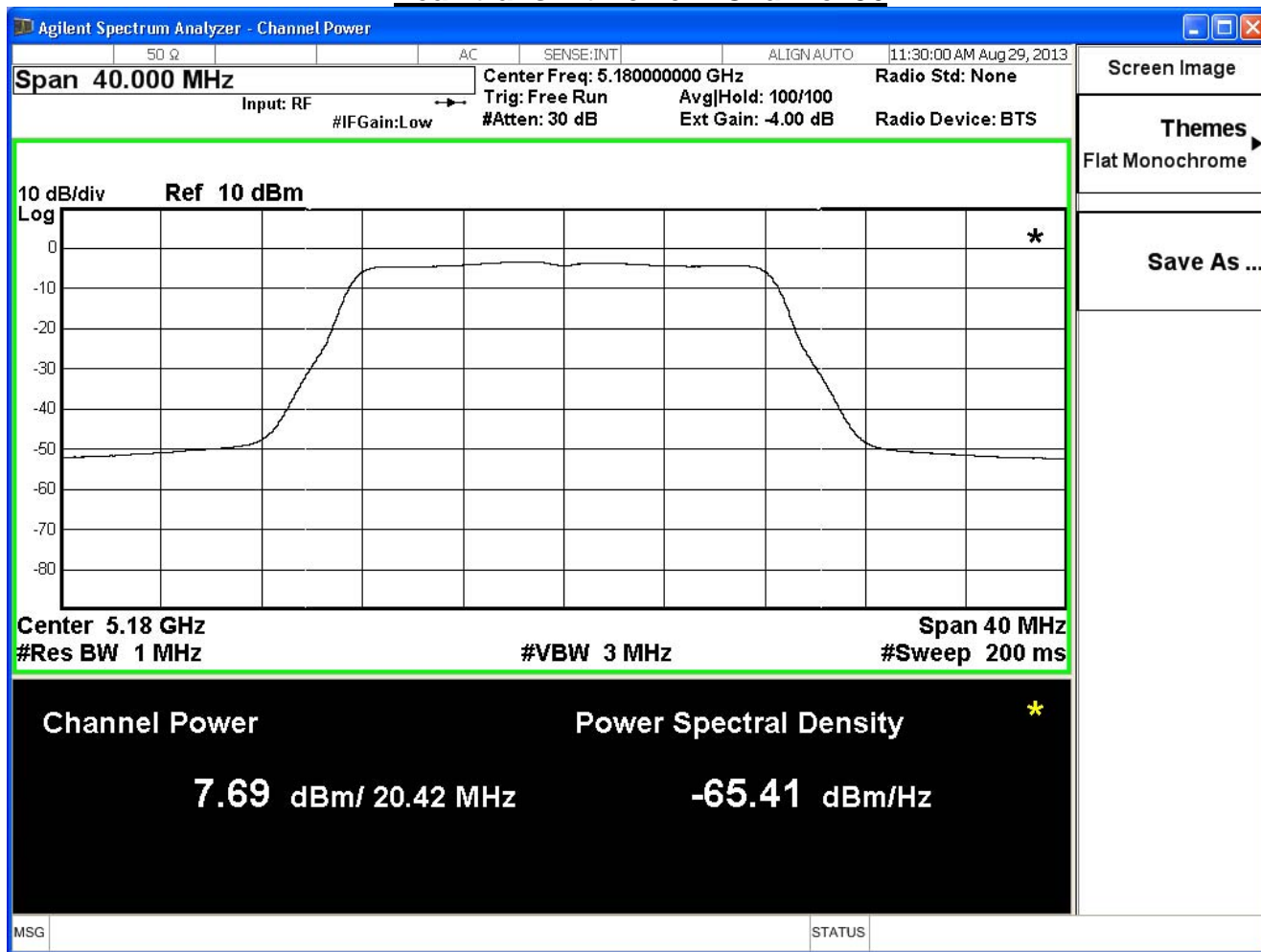
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/29	Test Site	SR7

802.11a (ANT 1)						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.42	7.69	≤17	≤17.11	Pass
44	5220	20.40	7.81	≤ 17	≤17.05	Pass
48	5240	20.46	7.77	≤ 17	≤17.11	Pass

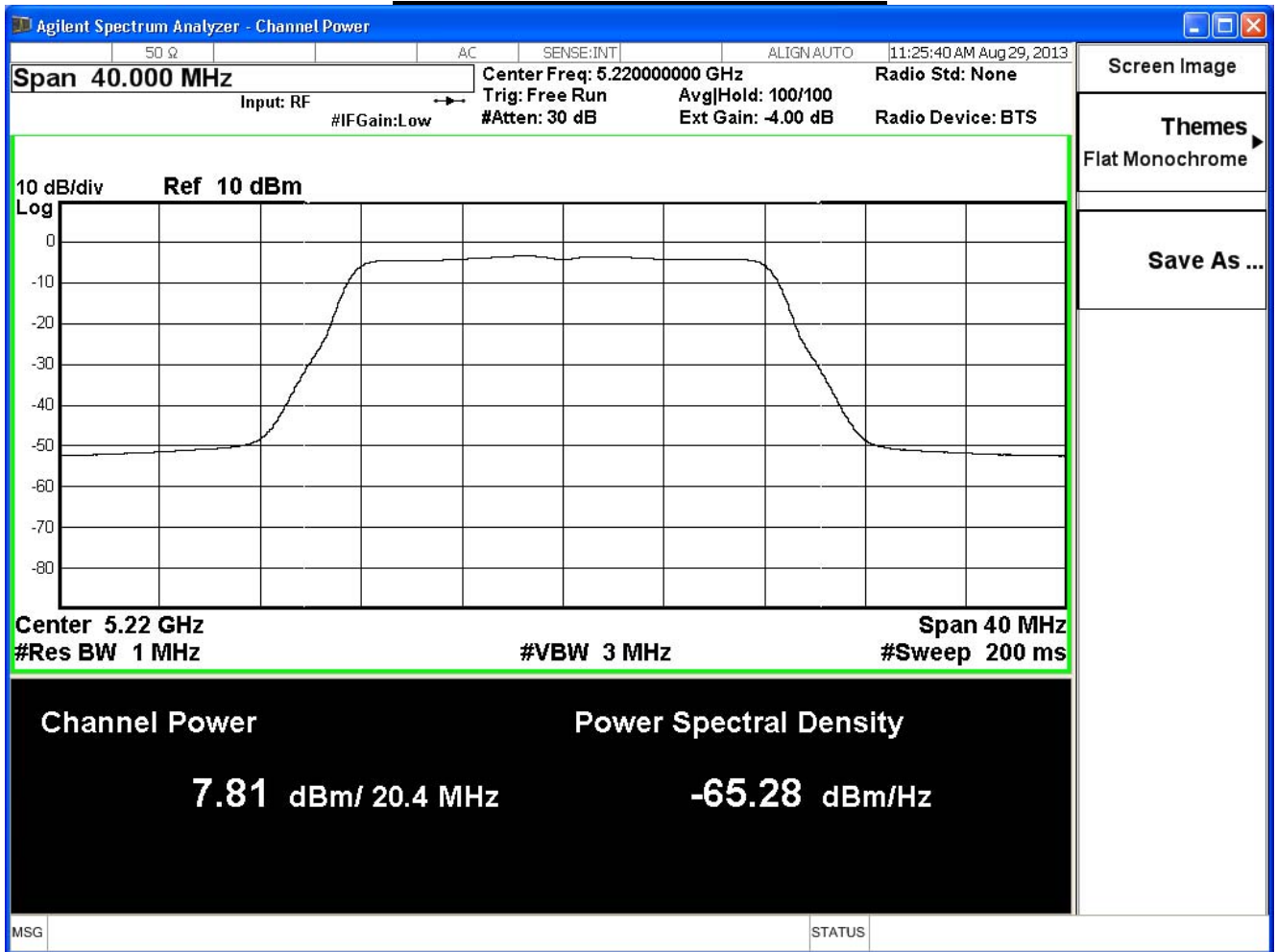
The worst emission of data rate is 6 Mbps.

Peak Power Output (dBm)									
Channel No	Frequency (MHz)	Data Rate							Required Limit
		6	12	18	24	36	48	54	
36	5180	7.69	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	7.81	7.80	7.79	7.78	7.77	7.76	7.75	
48	5240	7.77	--	--	--	--	--	--	

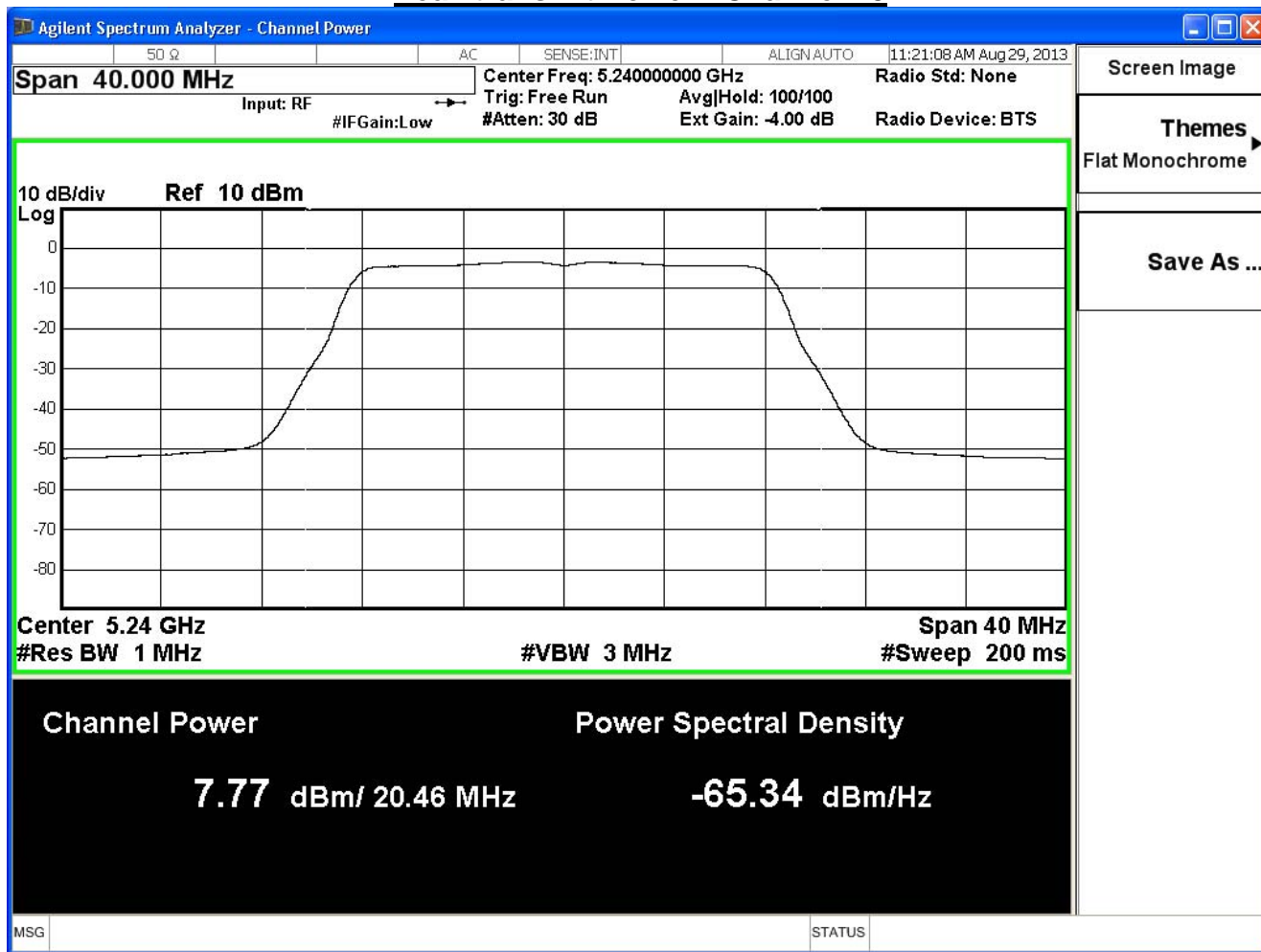
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



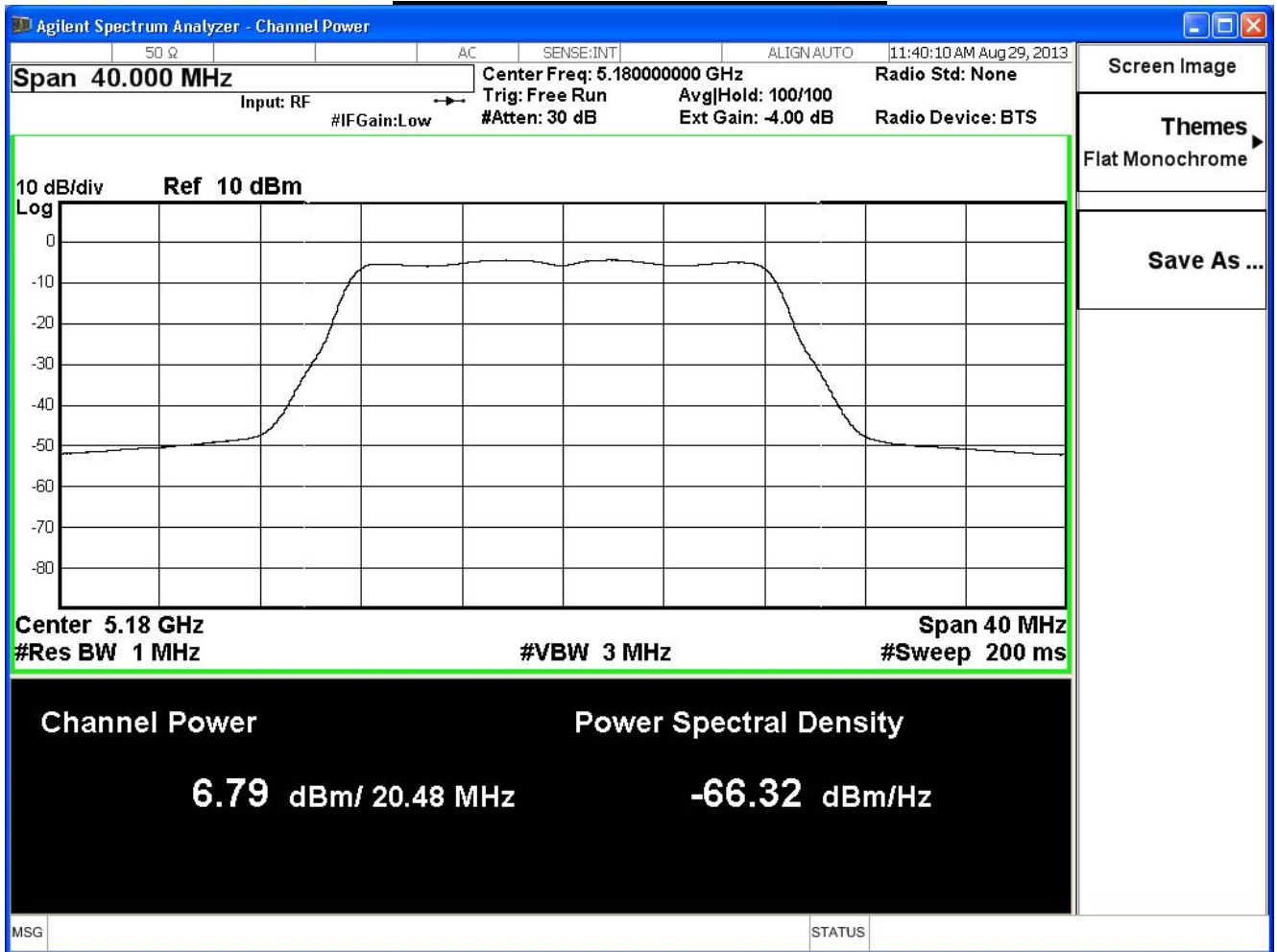
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/29	Test Site	SR7

802.11a (ANT 2)						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.48	6.79	≤17	≤17.10	Pass
44	5220	20.41	6.62	≤ 17	≤17.03	Pass
48	5240	20.43	6.79	≤ 17	≤17.05	Pass

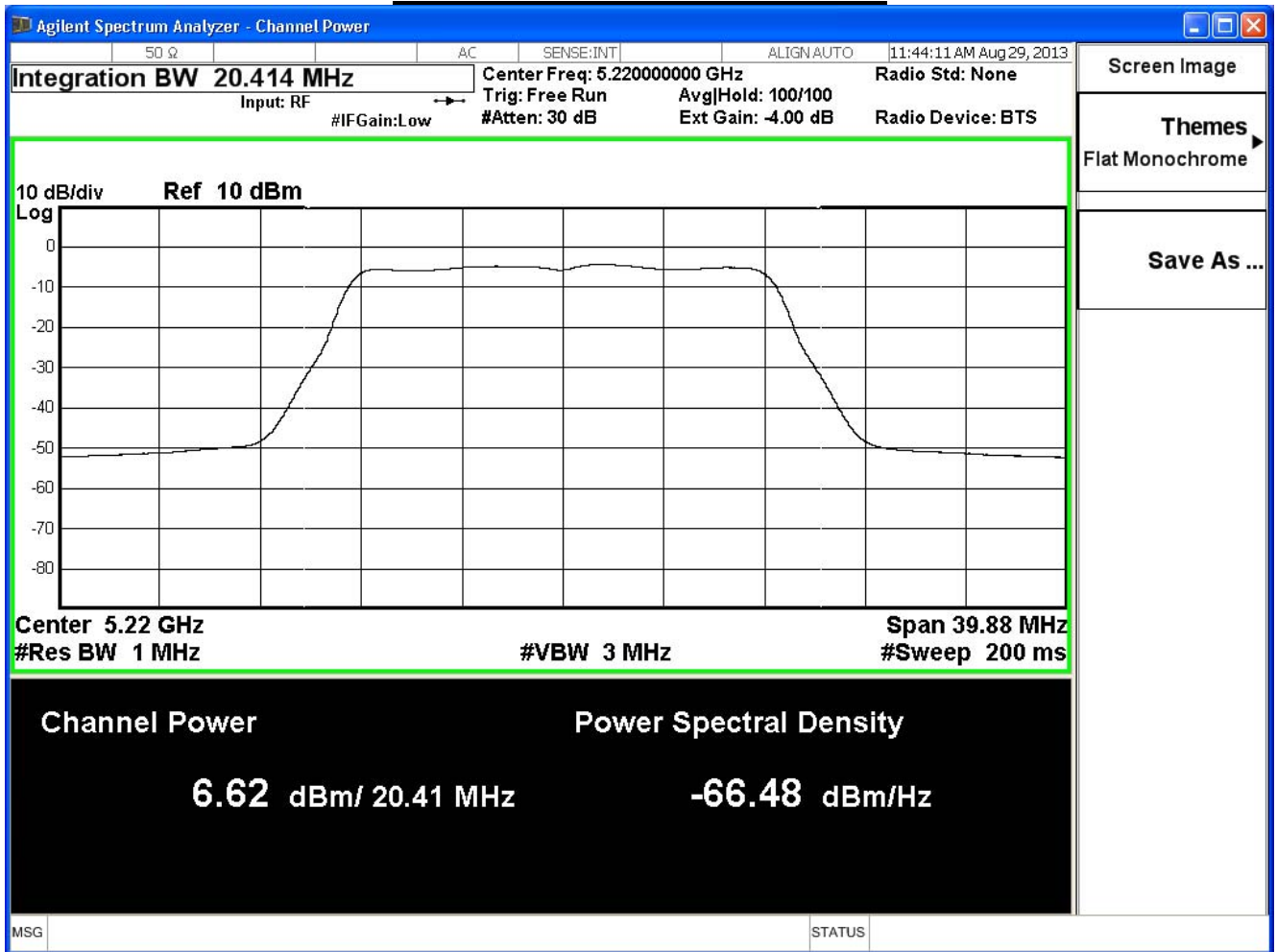
The worst emission of data rate is 6 Mbps.

Peak Power Output (dBm)									
Channel No	Frequency (MHz)	Data Rate							Required Limit
		6	12	18	24	36	48	54	
36	5180	6.79	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	6.62	6.61	6.60	6.59	6.58	6.57	6.56	
48	5240	6.79	--	--	--	--	--	--	

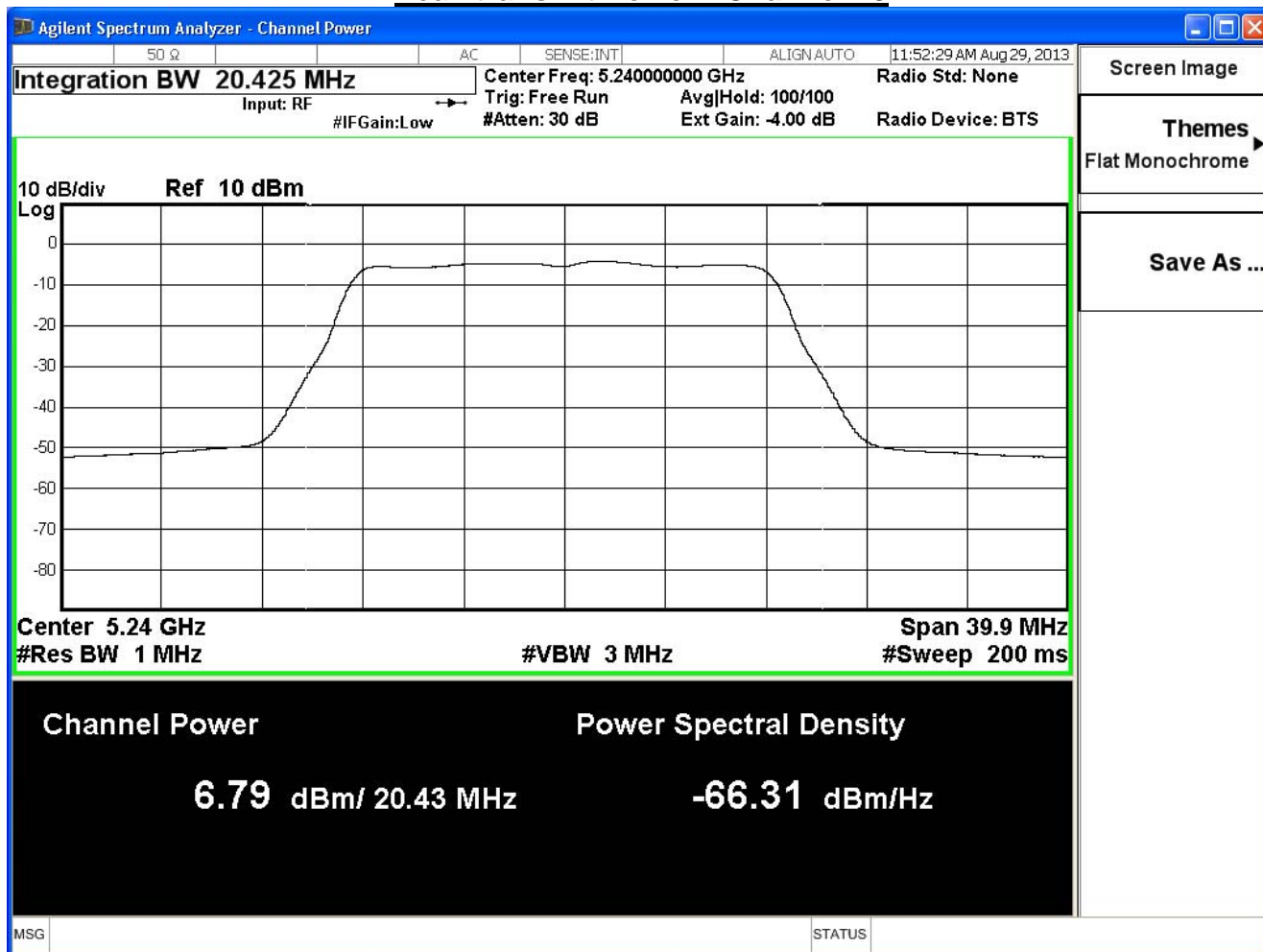
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/29	Test Site	SR7

802.11a (ANT 0+1+2)					
Channel No.	Frequency (MHz)	Total Output Power		Required Limit (dBm)	Result
		(mW)	(dBm)		
36	5180	16.53	12.18	≤17	Pass
44	5220	16.85	12.27	≤ 17	Pass
48	5240	16.91	12.28	≤ 17	Pass

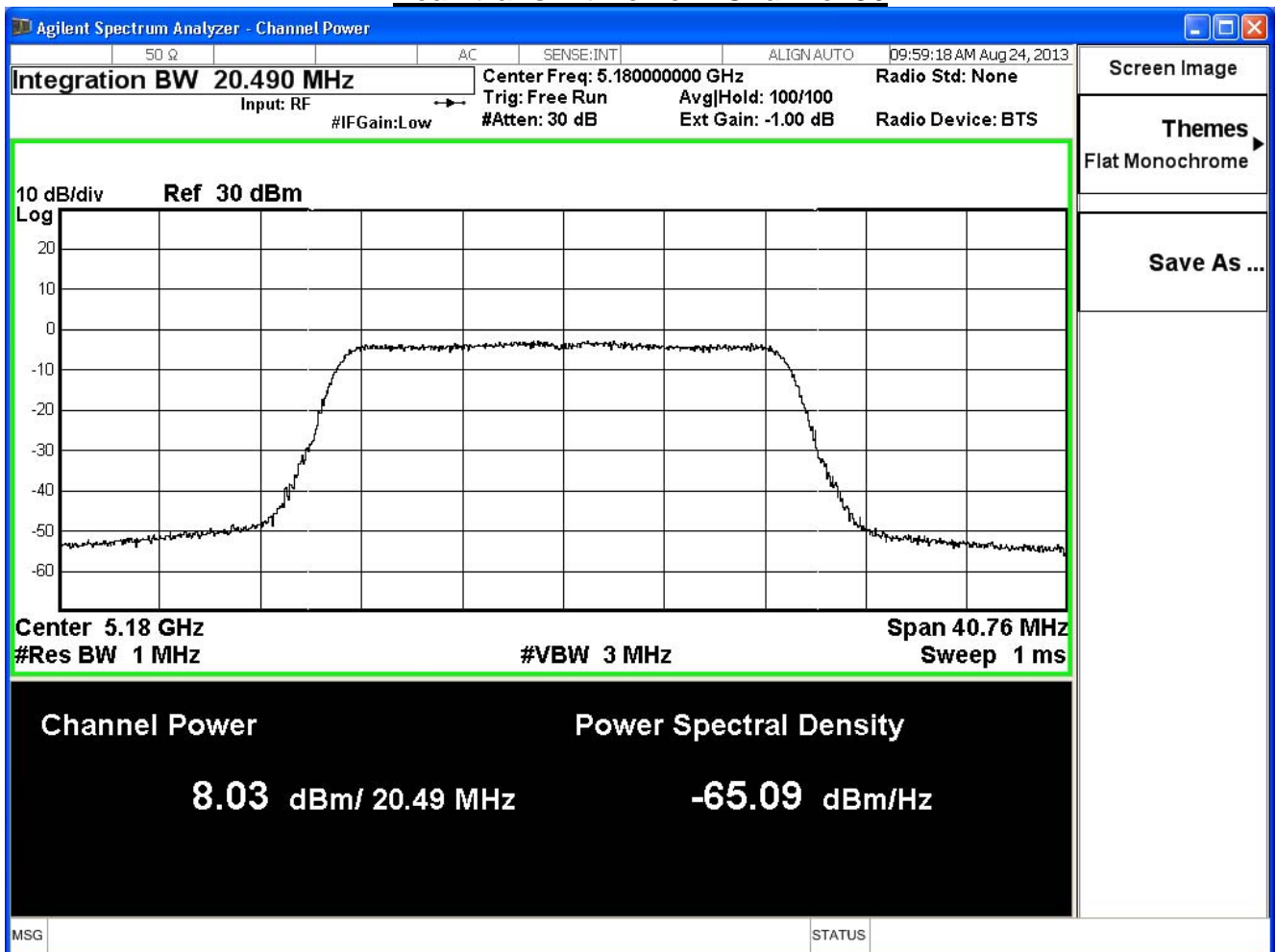
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/24	Test Site	SR7

IEEE 802.11n(20MHz)_ANT 0						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.49	8.03	≤17	≤17.11	Pass
44	5220	20.23	8.19	≤ 17	≤17.05	Pass
48	5240	20.51	7.86	≤ 17	≤17.11	Pass

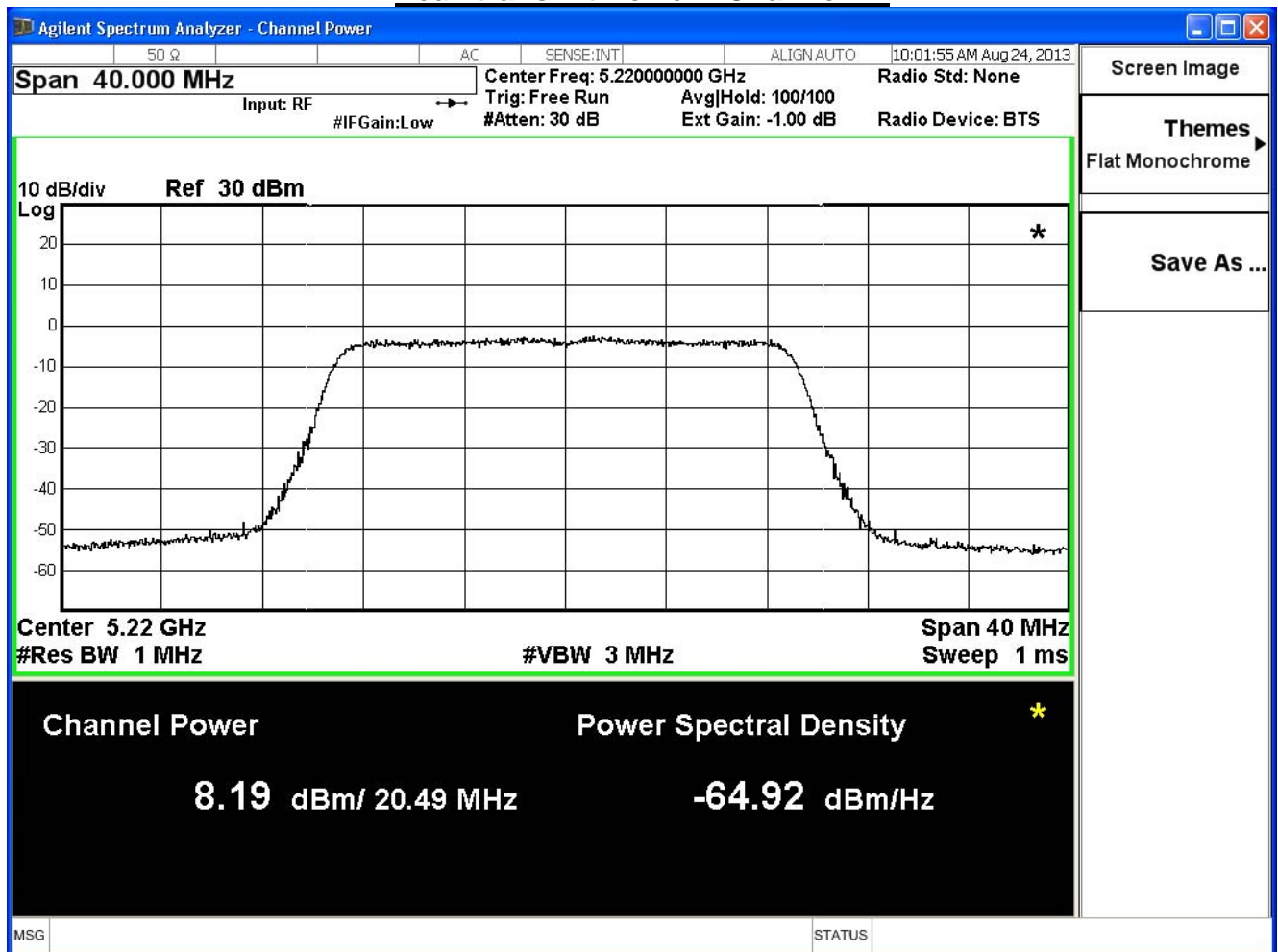
The worst emission of data rate is 19.5Mbps.

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		19.5	39	58.5	78	117	156	175.5	195	
36	5180	8.03	--	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	8.19	8.18	8.17	8.16	8.15	8.14	8.13	8.12	
48	5240	7.86	--	--	--	--	--	--	--	

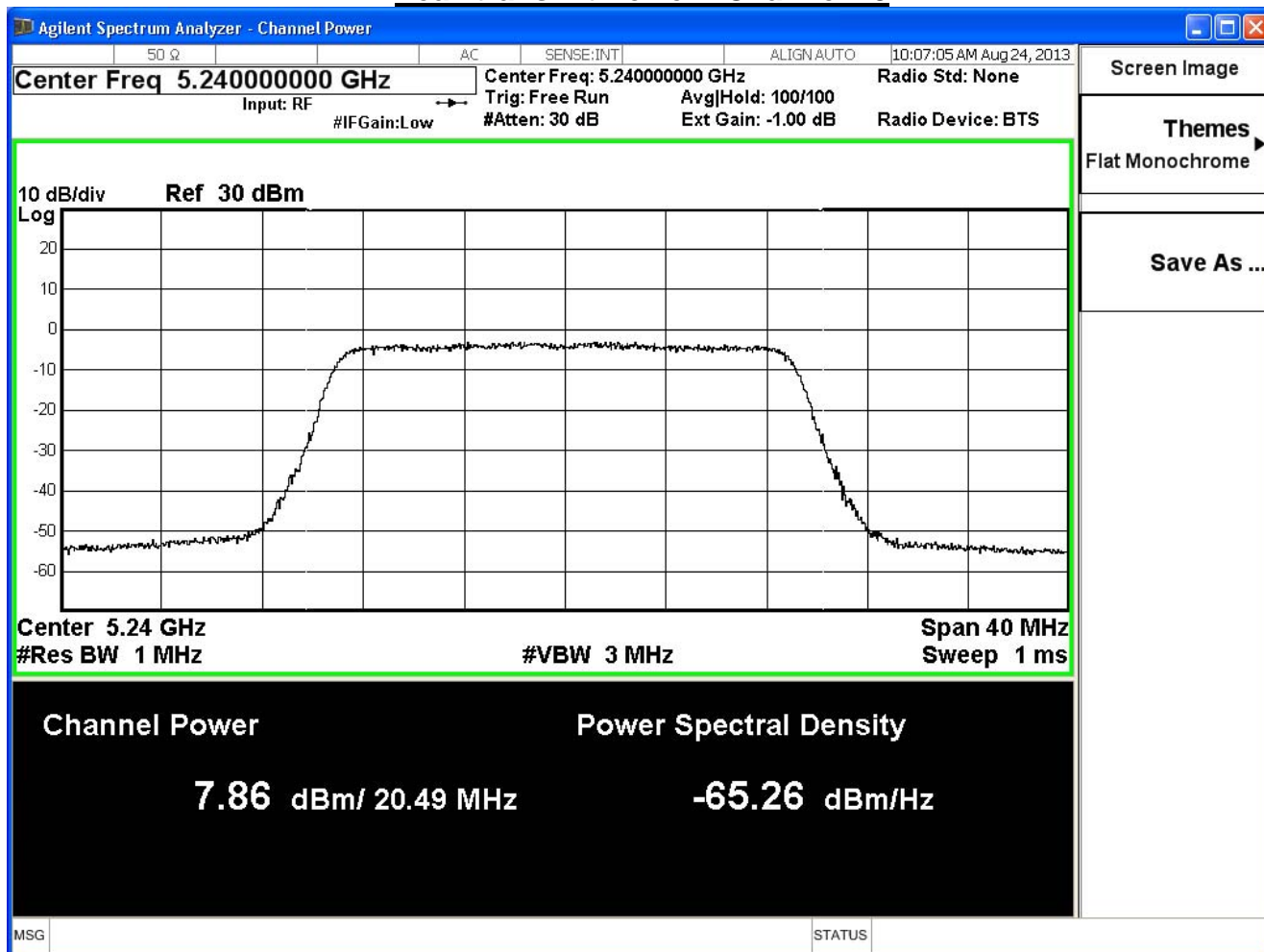
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



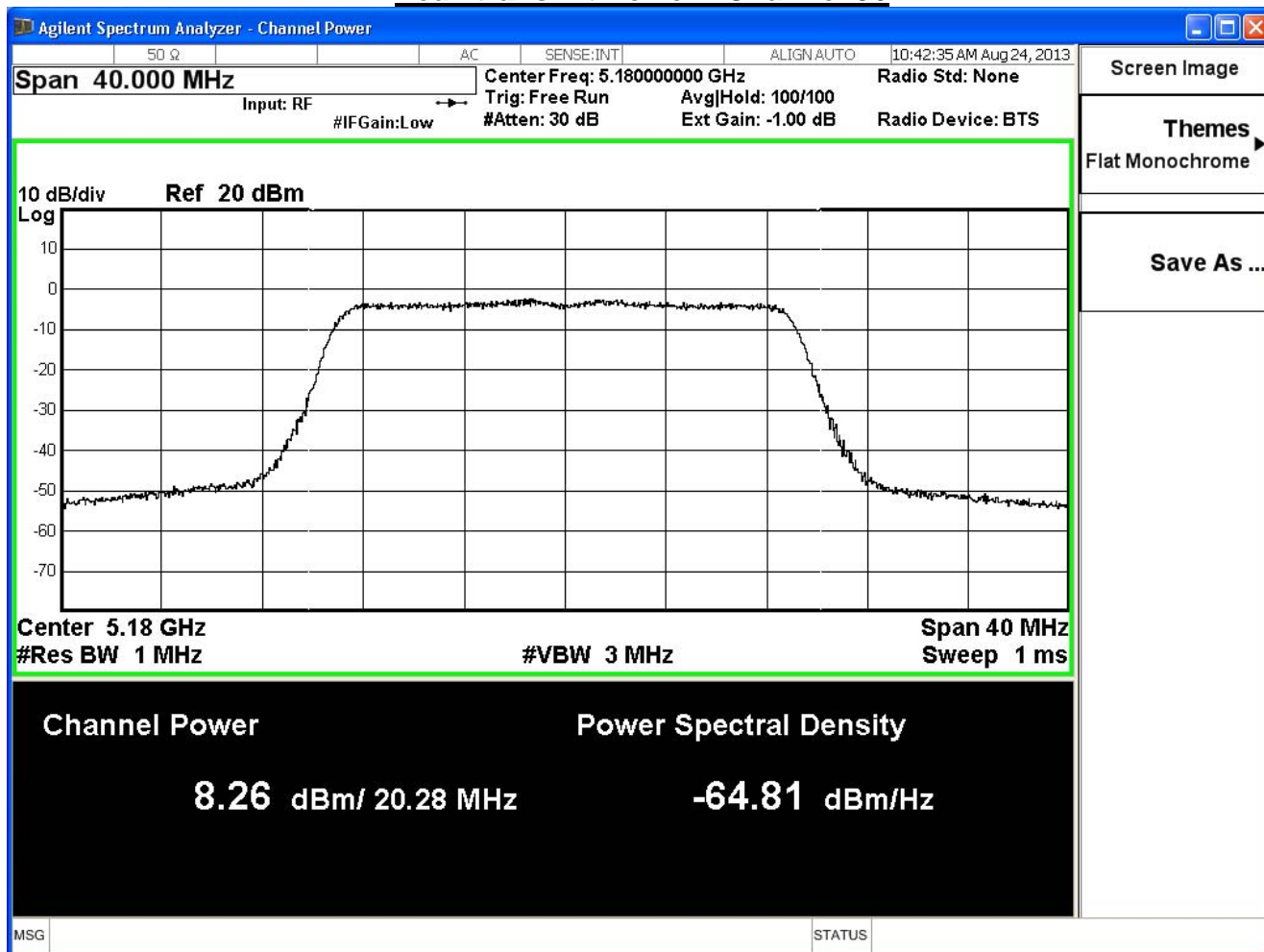
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/24	Test Site	SR7

IEEE 802.11n(20MHz)_ANT 1						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.28	8.26	≤17	≤17.07	Pass
44	5220	20.35	7.79	≤ 17	≤17.08	Pass
48	5240	20.12	8.40	≤ 17	≤17.03	Pass

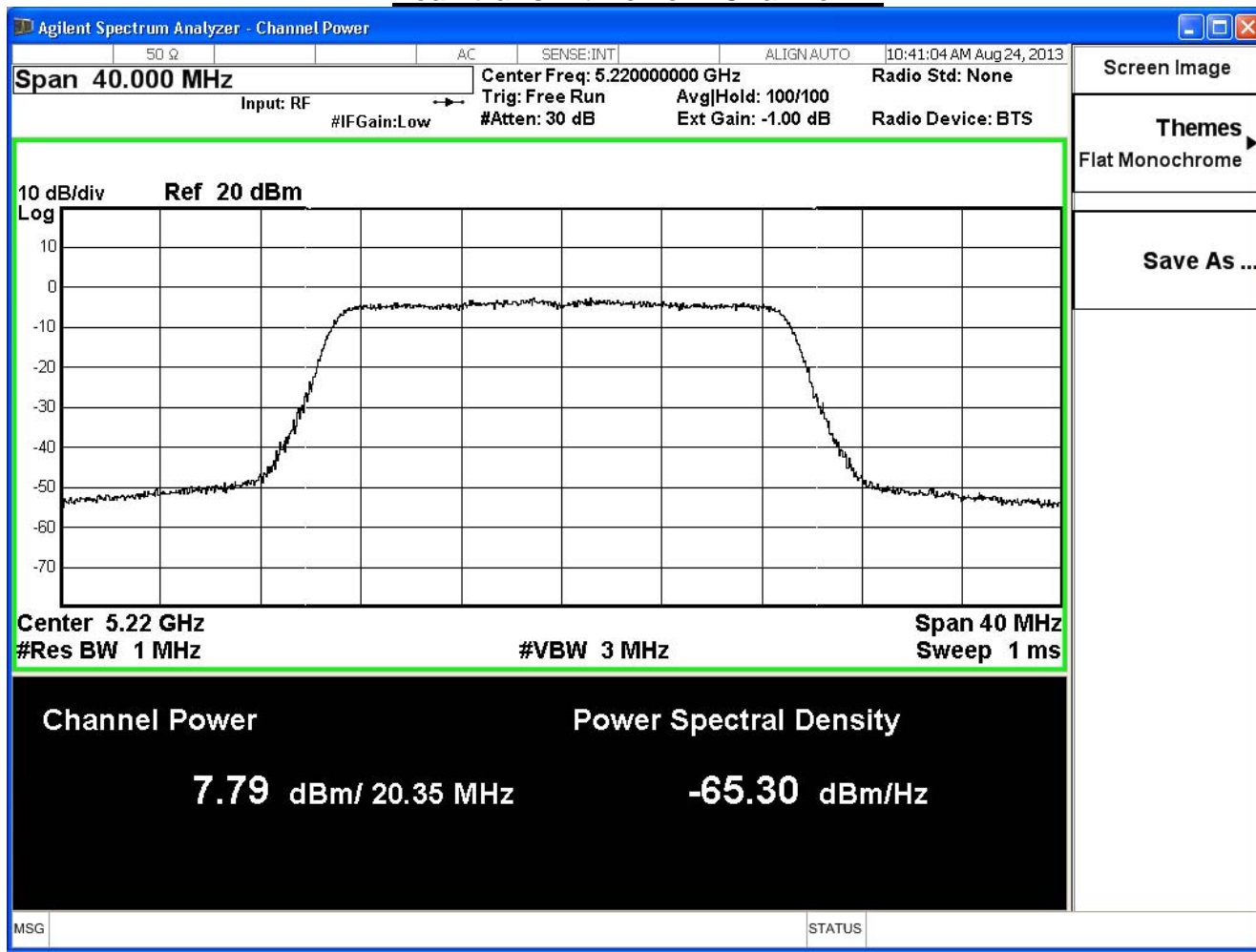
The worst emission of data rate is 19.5Mbps.

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		19.5	39	58.5	78	117	156	175.5	195	
36	5180	8.26	--	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	7.79	7.78	7.77	7.76	7.75	7.74	7.73	7.72	
48	5240	8.40	--	--	--	--	--	--	--	

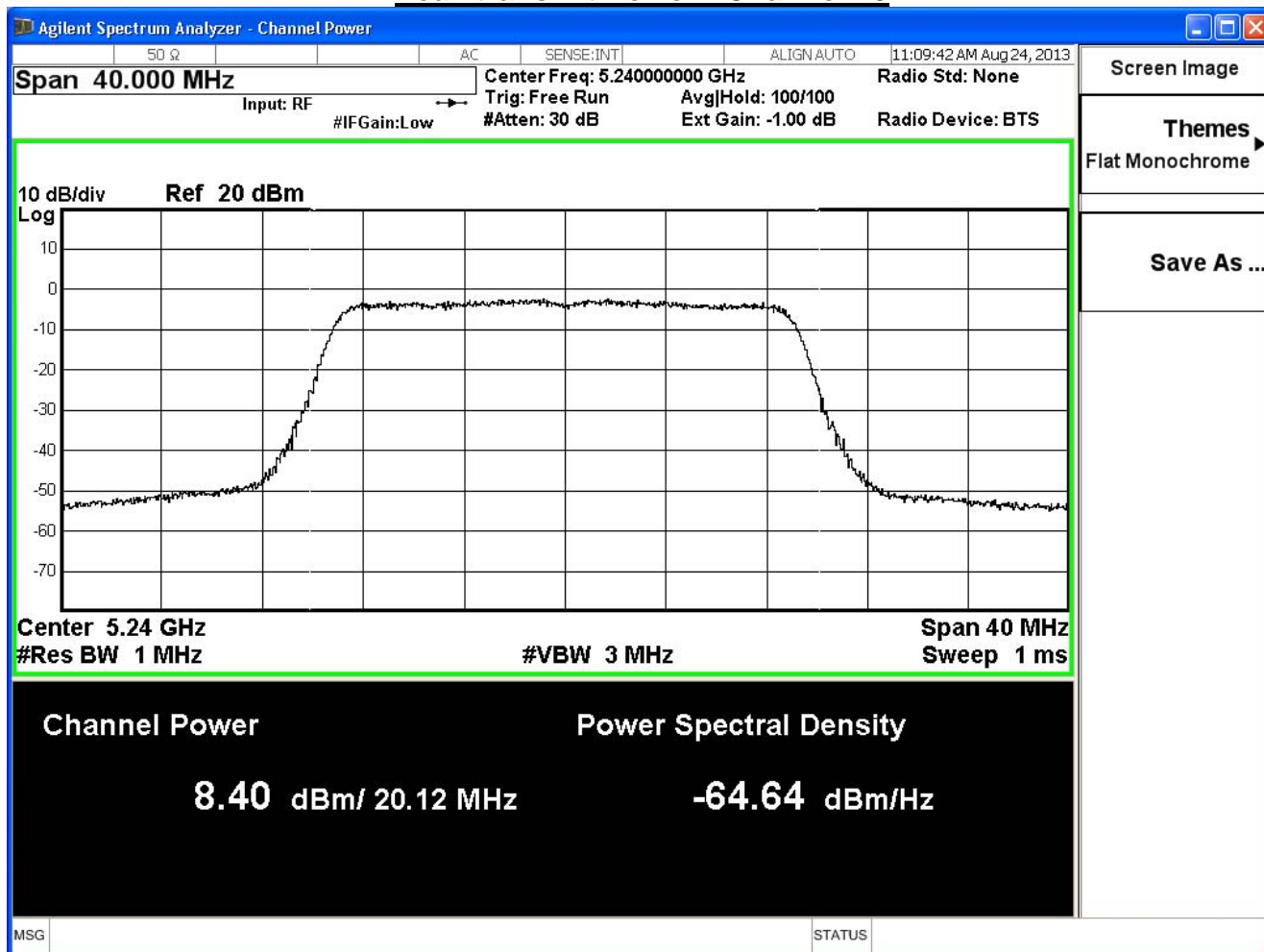
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



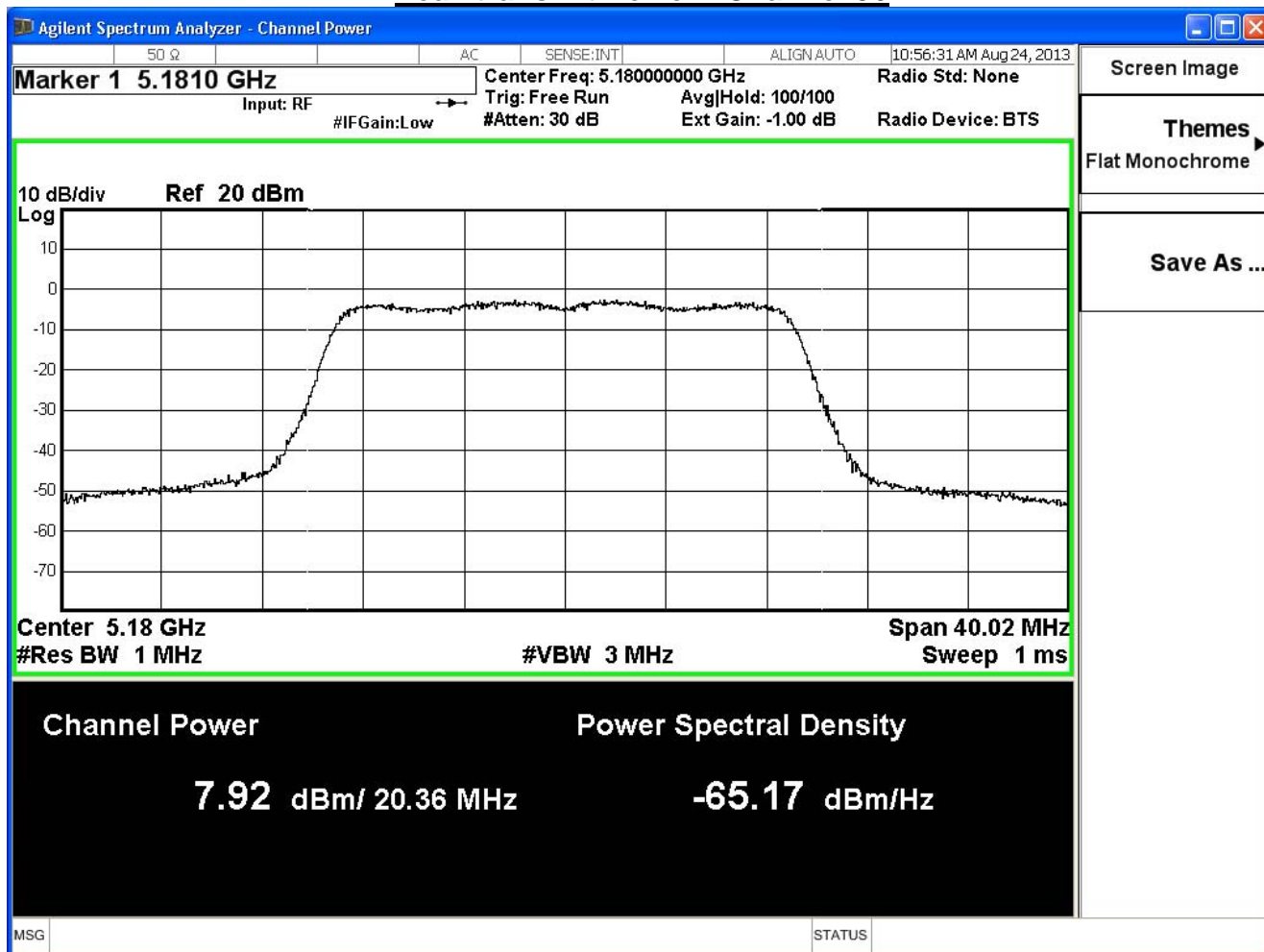
Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/24	Test Site	SR7

IEEE 802.11n(20MHz)_ANT 2						
Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Output Power (dBm)	Required Limit		Result
				Fixed Limit (dBm)	4+10logB Limit (dBm)	
36	5180	20.36	7.92	≤17	≤17.08	Pass
44	5220	20.35	7.94	≤ 17	≤17.08	Pass
48	5240	20.38	8.02	≤ 17	≤17.09	Pass

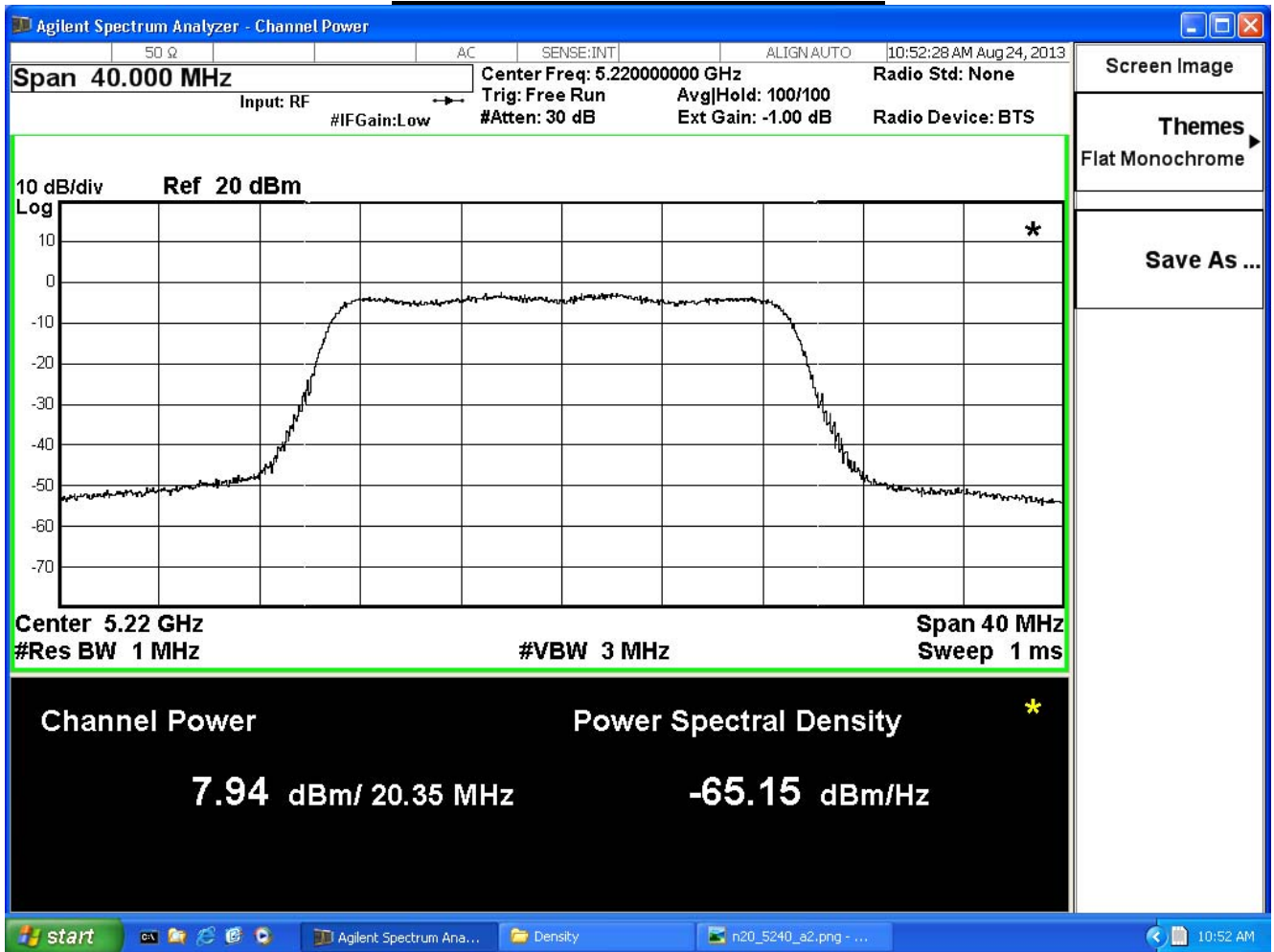
The worst emission of data rate is 19.5Mbps.

Peak Power Output (dBm)										
MCS Index		16	17	18	19	20	21	22	23	Required Limit
Channel No	Frequency (MHz)	Data Rate								
		19.5	39	58.5	78	117	156	175.5	195	
36	5180	7.92	--	--	--	--	--	--	--	17dBm or 4dBm+10logB
44	5220	7.94	7.93	7.92	7.91	7.90	7.89	7.88	7.87	
48	5240	8.02	--	--	--	--	--	--	---	

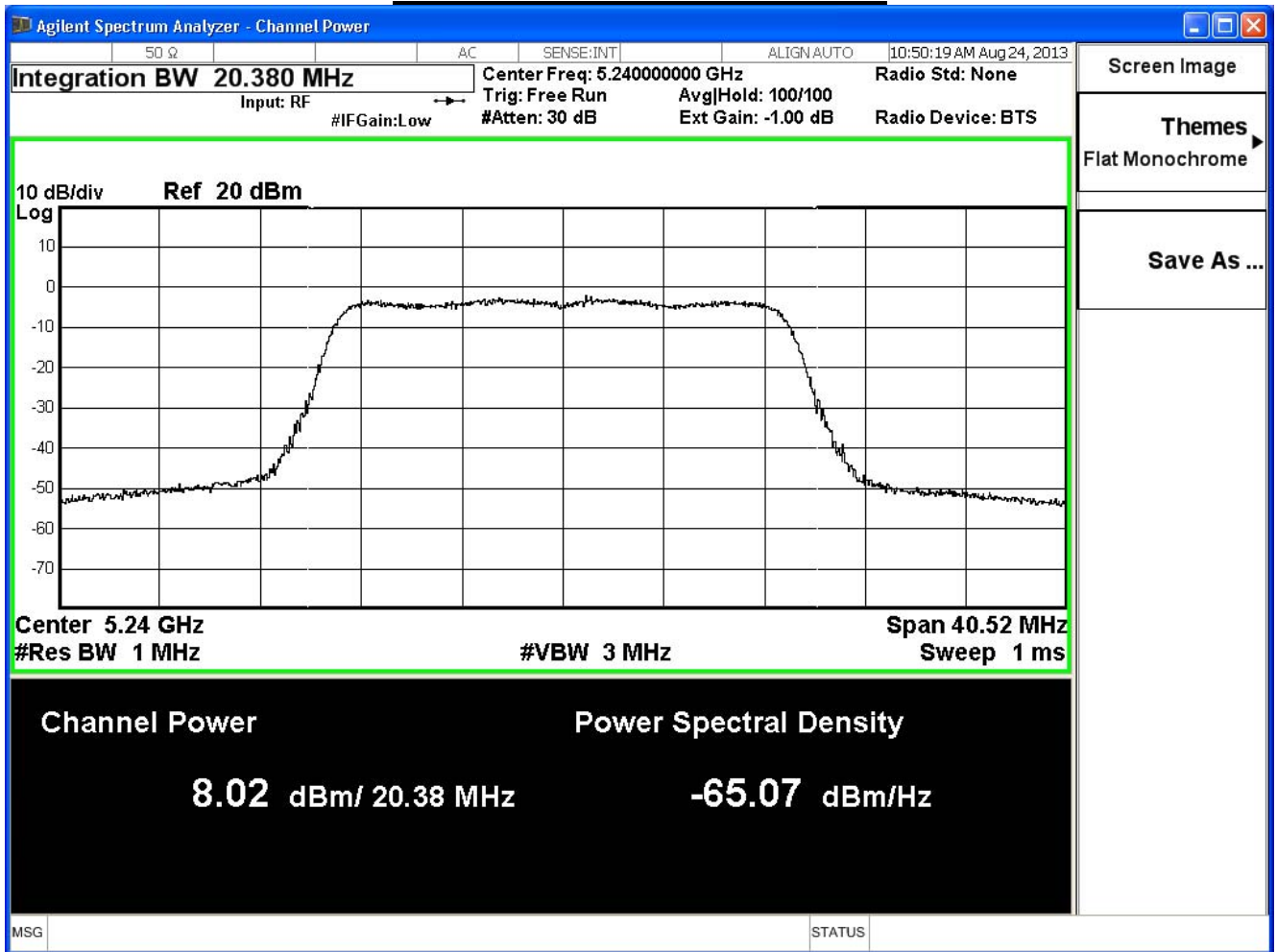
Peak transmit Power - Channel 36



Peak transmit Power - Channel 44



Peak transmit Power - Channel 48



Product	Dual Band 3x3 802.11ac PCI-E Adapter		
Test Item	Peak Transmit Output		
Test Mode	Mode 1: Transmit (CDD mode)		
Date of Test	2013/08/24	Test Site	SR7

IEEE 802.11n(20MHz)_ANT 0+1+2					
Channel No.	Frequency (MHz)	Total Output Power		Required Limit (dBm)	Result
		(mW)	(dBm)		
36	5180	28.18	12.84	≤17	Pass
44	5220	30.47	12.75	≤ 17	Pass
48	5240	27.98	12.87	≤ 17	Pass